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THE BOMBAY COAST GUARD

गुरुकुल कांगड़ी विश्वविद्यालय, हरिद्वार

पुस्तकालय



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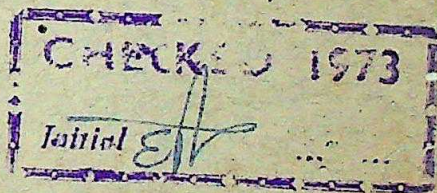
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OF THE
BOMBAY NATURAL HISTORY SOCIETY.

EDITED BY

REV. J. F. CAIUS, S.J., F.L.S.

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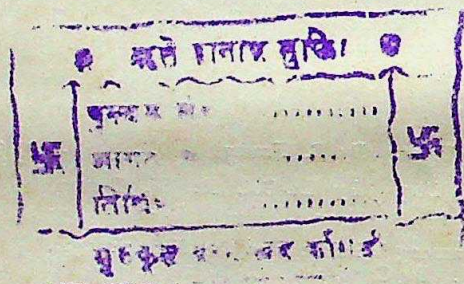
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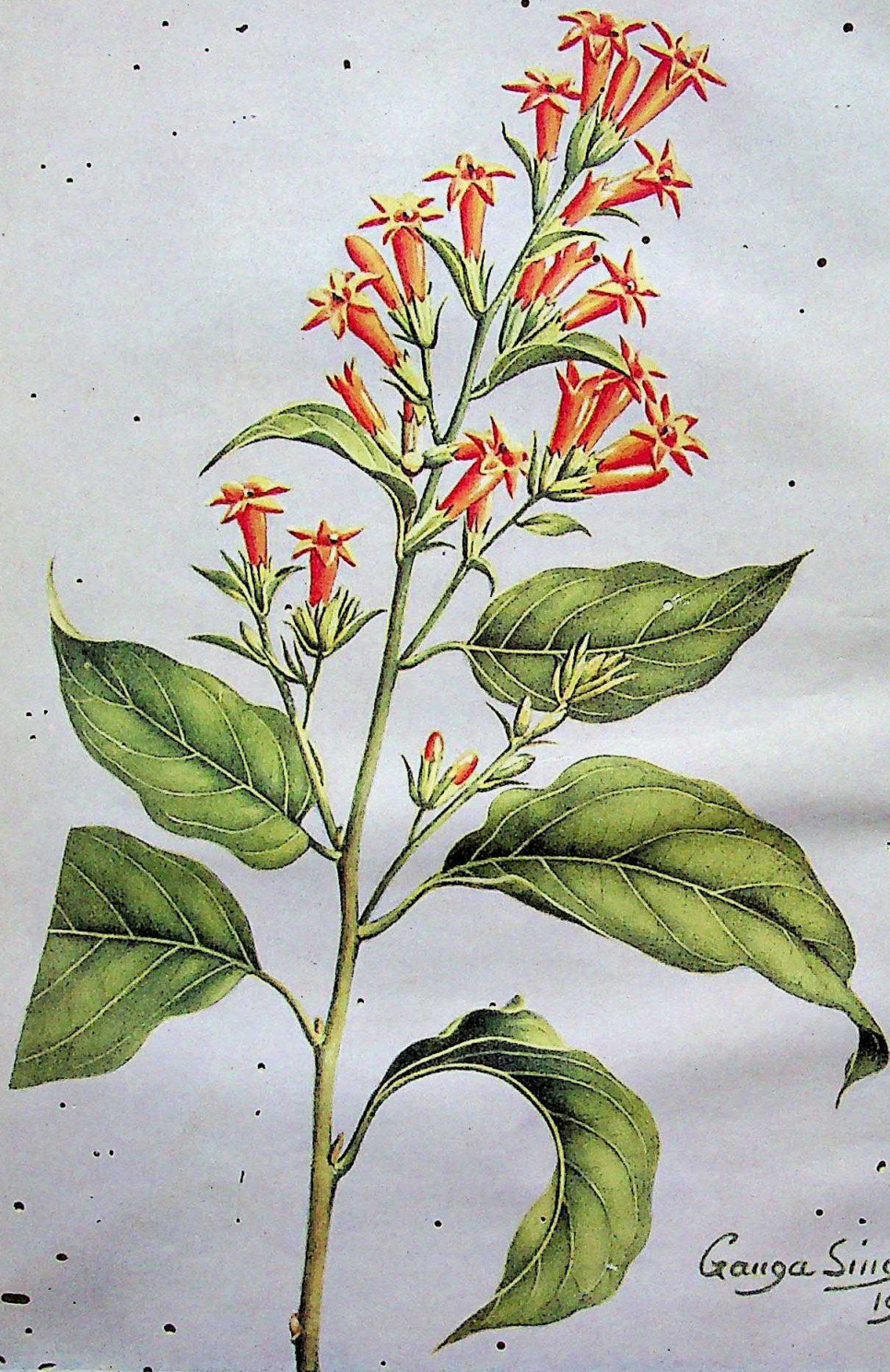
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The Golden Cestrum.
CESTRUM AURANTIACUM Lindl.



JOURNAL OF THE Bombay Natural History Society.

1942.

VOL. XLIII.

No. 1.

SOME BEAUTIFUL INDIAN CLIMBERS AND SHRUBS.

BY

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PART X.

(Continued from Vol. xlii, No. 4 (1941), p. 703).

(With 1 coloured and 8 black and white plates and 5 text-figures).

Solanaceae.

THE DEADLY NIGHTSHADE FAMILY.

Solanaceae is derived from *Solanum*, a name used by Pliny to designate the well-known Bitter-sweet (*Solanum dulcamara* Linn.) a poisonous plant found in waste places in Europe.

The *Solanaceae* comprise herbs, erect or climbing shrubs, or even small trees. The leaves are usually alternate, entire, or lobed or cleft in various ways, exstipulate. The inflorescence is either lateral or terminal and the flowers are cymose or paniced or even solitary, regular, pentamerous or tetramerous. The corolla is gamopetalous, short and rotate or long and infundibuliform, rarely campanulate, more or less deeply lobed, sometimes entire; lobes 4-5-10. Stamens 4-5, inserted on the corolla tube; the filaments are very short and the anthers are either attached by the base or by the dorsal surface. Dehiscence is by pores or longitudinal slits. The ovary is in most cases 2-locular, rarely with 3-4-5 compartments; ovules many, on prominent peltate placentas; style linear; stigma capitate or shortly lobed. Fruit a berry or capsule, many-seeded. Seeds compressed, discoid or kidney-shaped.

The family contains many plants cultivated for food e.g., potato, tomato, Cape gooseberry, capsicum and tree tomato. The tobacco plant, *Nicotiana Tabacum* Linn., is widely cultivated in this country. The family also contains many well-known ornamental plants among which are *Browallia*, *Petunia*, *Solanum*, *Brunfelsia*, *Datura*, *Cestrum*, *Schizanthus* and *Salpiglossis*.

Apart from the value of the family to horticulturists, many species found wild in nature are prized as drug plants. The Deadly Nightshade, *Atropa Belladonna* Linn., derives its specific name from the fact that in bygone days ladies in Italy used the leaves to impart lustre to their eyes and so enhance their beauty. The plant actually contains a drug (atropine) which is used for ophthalmic complaints, for neuralgia and as a valuable antidote in opium poisoning. One of its effects is to enlarge the pupil of the eye. The berries are sweet and poisonous and are often eaten by children with fatal results. The name *Atropa* is from the Greek, *Atropos*, one of the Fates who cut the thread of life, and has reference to its deadly poisonous nature. *Belladonna* is found wild in India on the Himalayan ranges of the Punjab, Kashmir and Lahoul.

The Henbane (*Hyoscyamus niger*, Linn.) is a common plant of rather high altitudes in the western Himalayas. It is supposed to be fatal to fowls hence the trivial name. In the middle ages in Britain it was used for toothache. The alkaloids it contains are narcotic and antispasmodic.

Two species of *Withania* Pauq., *W. coagulans* Dunal and *W. somnifera* Dunal, are found in India. The former is found in the Punjab, Sind and Baluchistan. The seeds have the interesting property of being able to coagulate milk, and hence can be used as a substitute for animal rennet. The fresh fruit can be used as an emetic. *W. somnifera* Dunal, found in Bombay, possesses an alkaloid which is used in rheumatism, as an aphrodisiac and as a cure for scorpion sting.

Datura is another genus with poisonous properties. An account of these properties will be found under the genus.

No account of the *Solanaceae* would be complete without some mention of the Mandrake, a plant famous in legend and history. This genus of plants, *Mandragora*, has been for many centuries, and is even today, regarded with superstitious awe. All this superstition has arisen because the thick fleshy root bears a remote resemblance to a human figure. To that resemblance can be directly traced the belief that the plant shrieks when pulled from the earth.

Apart from this, however, it was known in ancient times as an aphrodisiac and also as an anaesthetic. According to F. W. Jones¹, 1935, it is a well-attested fact that Hua T'o, the great Chinese surgeon, who was born in the first century after Christ, performed major operations (such as the removal of the spleen) upon patients to whom he had administered a drug that produced insensibility. Part of the fame of that fabled plant, the mandrake, rests upon the fact that it was the first anaesthetic discovered by man. Its properties have been known for over three thousand years, but only

¹ Jones, F. W., Syme Oration, 'The Master Surgeon,' 1935.

comparatively recently has it been shown that it contains hyoscyne, hyoscyamine and scopolamine as well as other soporific alkaloids. In ancient medicine this plant was used to produce deep sleep and complete insensibility.

The roots of this plant, and the tuberous roots of certain other plants, are even at the present day, carved to resemble more nearly a human figure, and are hoarded by the superstitious as powerful magical charms.

As can be expected, a plant which had these valuable medical properties and which also possessed certain human characteristics, acquired in olden times the most extravagant reputation for magical powers. Theophrastus, for instance, in his history of plants, says that it is dangerous to gather it unless a sword is swung in a circle three times, and the face turned towards the west before the plant is lifted from the ground.

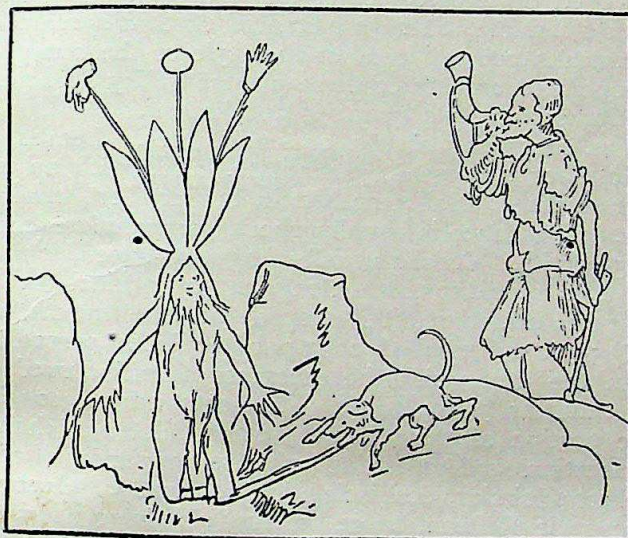


Fig. 1.—Harvesting the Mandrake.
(From a drawing in the Nürnberg Museum).

But listen to what Josephus wrote in the first century after Christ in his history of the Jewish war: 'In the valley in which the town of Macharus is situated, is found a wonderful root called Baara. In colour it is a fiery-red and in the evening it emits rays of light. It is difficult to pluck it because it avoids the hand of anyone who goes near, and in any case to touch it means certain death. There is a way, however, in which it can be collected quite harmlessly. You must dig away the soil from around the plant so that it is only attached to the earth by a single rootlet. A dog is taken and tied to the root. Its owner then calls it and it will run to him at the same time severing the rootlet. It immediately falls dead and then the plant can be handled without danger. Men take such great trouble because of its wonderful properties. It can even drive out evil spirits if it is brought near a sick person.' Baara was an early name of the mandrake. The accompanying sketch shows the conception of an artist of the Middle Ages of the way in

which the plant should be collected. It follows very closely the procedure recommended by Josephus.

KEY TO THE GENERA.

Flower trumpet-shaped or if salver-shaped with a short tube.

Fruit a drupe.

Corolla tube longer than the lobes. ...

Corolla tube shorter than the lobes. ...

Fruit a capsule ...

Flower salver-shaped with a long tube. ...

... 1. *Cestrum*.

... 2. *Solanum*.

... 3. *Datura*.

... 4. *Brunfelsia*.

PART I.

1. *Cestrum* Linn.

The name *Cestrum* is derived from the Greek word *kestron*, which was used by Dioscorides in his manual on medicinal plants to designate a Labiate, *Stachys officinalis* or *S. alopecuroides*. The word itself means pointed iron, or the style of the ovary, and may refer to the pointed anthers of these plants. Why Linnaeus applied the name *Cestrum* to this genus is not known.

This genus comprises shrubs or small trees. Leaves alternate, entire, petioled or subsessile, exstipulate, often with an unpleasant odour when bruised. Inflorescence in axillary or terminal cymes or panicles. The calyx is usually short, campanulate or cylindric, 5-lobed or 5-partite. Corolla usually fragrant, green, white, yellow, orange or even reddish; tube elongate, cylindrical or narrowly infundibuliform, sometimes bell-shaped at the mouth and then contracted, 5- or more-lobed or 5-partite; lobes spreading, much shorter than the tube, with the margins often incurved, glabrous or hairy. Stamens 5, included. Filaments adnate to the corolla for a large portion of their length, often dilated or hairy at the point of insertion and provided with an appendage of variable shape; anthers globular, dehiscing longitudinally. Ovary 2-celled; ovules few; style filiform, more or less glandular at the summit; stigma capitate. Fruit an oblong or ovoid berry, black, purple or rarely white.

The *Cestrums* are natives of South and Central America, but are now cultivated in the open in many parts of the warmer regions of the world or under glass in temperate latitudes.

When flowering the flowers are usually to be found pendulous, a position which ensures that the pollen is not wetted and rendered ineffective by rain.

Owing to the fact that the flowers of *Cestrum* are fragrant, it is to be inferred that this is a device to secure cross fertilisation. In the case of some species the flowers are only fragrant at night which leads one to believe that the unconscious agent of cross-pollination is a night-flying insect.

If cross-fertilisation is not accomplished the flowers still possess a mechanism which ensures self-pollination. When the stigma has been fertilised the style decays. On the other hand when the anther cells have opened the corolla becomes detached from the receptacle. Should the style have decayed as a result of fertilisation the corolla can drop off. If, however, the style is still intact

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the corolla is prevented from dropping off by the appendages at the base of the filaments. These appendages vary in shape but are often tongue-like processes which curve inwards round the style. The corolla on becoming detached is prevented from dropping off immediately by the tips of the appendage becoming locked under the capitate stigma. There is, therefore, every likelihood of self-fertilisation taking place even though cross-fertilisation has not been accomplished through the agency of insects.

KEY TO THE SPECIES.

Flowers reddish.	<i>C. elegans.</i>
Flowers white, green or varying shades of yellow.	
Lobes of corolla blunt, becoming distinctly reflexed.	
Corolla orange-yellow.	<i>C. aurantiacum.</i>
Corolla white.	<i>C. diurnum.</i>
Lobes acute, erect or spreading.	
Leaves oblong-ovate, shortly acuminate, not foetid when bruised.	<i>C. nocturnum.</i>
Leaves lanceolate, very long tapering, very foetid when bruised.	<i>C. Parqui.</i>

Cestrum elegans Schlecht.

Description.—A large shrub with pendulous, leafy branches; branches cylindrical, covered with a soft velvety pubescence. Leaves



Fig. 2.—*Cestrum elegans* Schl. $\times 3/4$.

alternate, exstipulate, shortly petioled, lanceolate or oblong-lanceolate in shape, quite entire, tapering to a point, 3-4 in. long, up to 1 in. wide, covered on both surfaces with short, crisped hairs, particularly so on the nerves beneath, deep green in colour, membranous in texture, rounded, acute or obscurely cordate at the base; petiole 1 in. long, pubescent.

Inflorescence in axillary or terminal dense, pendulous, thyrsoid, compound racemes. Individual flowers subtended by hairy bracteoles, sessile or subsessile. Calyx .2 in. long, top-shaped, green, hairy, 5-lobed; lobes broadly triangular-ovate, acuminate, erect. Corolla purplish-red, tubular, gradually inflated then contracted below the mouth, glabrous, .75 in. long. Lobes 5 or more, triangular, acute, very shortly ciliate on the margins, mouth and inner surface glabrous. Stamens as many as the corolla lobes and alternate with them; filaments inserted two-thirds the way down the tube, filiform; anthers included, small, yellow. Ovary globose, shortly stipitate, seated in a disk, 2-celled, ovules few on the axile placentas; style slender; stigma capitate. Fruit a berry, .5-.75 in. in diameter, fleshy, deep red-purple in colour, 2-celled, many-seeded.

Flowers.—September-December.

Distribution.—Native of Mexico, largely grown in gardens in temperate countries.

Gardening.—A shrub eminently suitable for growing in hill stations. The red purple flowers which are borne in dense, terminal drooping cymes are produced almost continuously throughout the year and make this shrub a very attractive object. It prefers partial shade and rich well-drained soil and is propagated by cuttings.

***Cestrum aurantiacum* Lindl.**

(*aurantiacum* is a Latin word meaning orange-red, and refers to the colour of the flowers).

Description.—An erect or scrambling shrub, glabrous or young parts puberulous. Leaves alternate, stipulate, petioled, ovate-acute or ovate-acuminate in shape, membranous in texture, entire, glabrous, dark green in colour, somewhat undulate on the margins, 3-4 in. long, up to 2.5 in. broad; petiole .75 in. long.

Inflorescence axillary or terminal in pedunculate, racemose or paniced clusters; peduncles often pubescent. Lower flowers pedicelled, the upper sessile or subsessile, bracteolate; bracteoles leaf-like, narrow, lanceolate, puberulous. Calyx gamosepalous, .25-.3 in. long, cylindrical-campanulate, 5-ribbed, each rib continued above into a linear awl-like lobe. Corolla tube constricted at the base, obconical in shape, orange-red in colour, .9 in. long, .3 in. wide at the top, ribbed; ribs double the number of the lobes. Lobes ovate-obtuse, completely reflexed at full anthesis, 5-7 in number. Stamens corresponding in number to the lobes and alternate with them; filaments inserted in the tube, adnate to the lower half of the tube, free in the upper half, included, appendaged; appendage bracket-like, glandular. Ovary seated on an obscure fleshy disk; style slender; stigma capitate.

Flowers.—October-December. Does not fruit in this country.

Distribution.—Native of Guatemala, now commonly cultivated in the warmer and temperate regions of the whole world.

Gardening.—A pretty bushy shrub with scentless orange flowers borne in panicles. It will grow up to 10 ft. or so and can withstand considerable moisture. Six weeks after flowering the plant should be well cut back in order to obtain a shapely bush and induce profuse



Photo by

The Golden Cestrum.

M. N. Bakshi

Cestrum aurantiacum, Lindl.
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M. N. Baksbi

The Golden Cestrum.

Photo by

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The Day Jasmine.

Gestrum diurnum Linn.

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The Day Jasmine.

Cestrum diurnum Linn.

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SOME BEAUTIFUL INDIAN CLIMBERS AND SHRUBS

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flowering. It prefers rich soil and is propagated by cuttings. This plant forms a very pretty green-house shrub and as its flowers do not drop off easily it has become a great favourite in all European gardens.

Cestrum diurnum Linn.

THE DAY JASMINE.

Description.—An erect shrub with numerous leafy branches. Branches green (fawn in age) with well-marked, white lenticels; young parts covered with a very sparse glandular scurf. Leaves



Fig. 3.—*Cestrum diurnum* Linn. $\times 1/1$.

alternate, exstipulate, petiolate, dark green above, pale below, glabrous, entire, obtuse at the apex, obtusely wedge-shaped below, ovate-lanceolate in shape, up to 5 in. long by 1.5 in. wide; petioles up to .5 in. long.

Inflorescence a long axillary peduncle bearing short clusters of white sweet-smelling flowers, each cluster supported by a leaf-like bract. Individual flowers sessile, with or without bracteoles, calyx gamosepalous, about .15 in. long, somewhat puberulent, obtusely 5-ribbed, 5-lobed; lobes, obtuse, ciliate. Corolla tube narrowly infundibuliform, white, sweet-scented, about .5 in. long, 5-lobed; lobes very obtuse, completely recurved when the flower is

fully open. Stamens oblong, 5 in number, alternate with the corolla lobes, brown in colour, included; filaments adnate to the tube, free for a very short distance. Ovary seated on a nectary-secreting disk; style filiform, glabrous; stigmas truncate-capitate. Berry nearly globular, black.

Flowers.—Rainy season. Fruits cold season.

Distribution.—Native of the West Indies, widely cultivated in gardens throughout the country.

Gardening.—A quick-growing evergreen shrub with dark green foliage and white flowers that are very sweet scented during the day. It is well suited for screens and borders. Easily propagated by seed which it produces abundantly. It is advisable to prune it after flowering so as to prevent it from becoming ragged.

Cestrum nocturnum Linn.

Lady of the Night. Night Jessamine. Rat-ki-rani (Hind.). (The specific name refers to the fact that this plant opens its flowers at night).



Fig. 4.—*Cestrum nocturnum* L. $\times \frac{3}{4}$.

Description.—A glabrous shrub reaching a height of 9 ft. Branches slender, smooth, often yellowish with numerous lenticels. Leaves alternate, exstipulate, ovate-oblong, acute at the apex, cuneiform or rounded at the base, membranous in texture, entire, glabrous, up to 4 in. long by 1.5 in. wide; petioles up to .5 in. long.

Inflorescence in many-flowered, pedunculate, axillary or terminal panicles, exceeding by much the length of the leaves; common peduncles up to 1 in. long, erect or spreading. Individual flowers supported by a lanceolate bract, pedicelled or subsessile. Calyx campanulate, sparsely glandular, .15 in. long, glabrous, with 5 small triangular teeth, which are acute, scarious and short ciliate at the tips. Corolla greenish, sweet-smelling at night, tube cylindrical or narrowly infundibuliform, about .75 in. long, .1 in. broad at the top; lobes 5, ovate-acute, margins incurved; stamens 5, alternate with the lobes of the corolla; filament

adnate to the corolla tube for a quarter of its length from the top,



Photo by

Lady of the Night.

Cestrum nocturnum, Linn.

New Forest, Dehra Doon

M. N. Bakshi



Photo by

Lady of the Night.
Cestrum nocturnum Linn.

M. N. Bakshi

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New Forest, Dehra Dun.
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Bakshi Photo by

Willow-leaved Jasmine

Gestrum Parqui L'Heritier.

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Willow-leaved Jasmine
Cestrum Parqui L'Heritier.

M. N. Bakshi

SOME BEAUTIFUL INDIAN CLIMBERS AND SHRUBS

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provided at the junction with a linear-acute appendage. Ovary globular, seated on a fleshy disk which probably secretes nectar; style filiform, glabrous; stigma capitate, above the stamens. Fruit a blue or blackish berry, ovoid in shape, about .16 in. long. Seeds numerous, compressed.

Flowers.—Practically throughout the year, but most profusely during the rains. Fruit cold season.

Distribution.—Indigenous to the West Indies. Largely cultivated throughout the plains of this country.

Gardening.—A hardy sub-scandent, quick-growing shrub about 10 ft. high. The small, greenish and rather inconspicuous flowers, which are produced in great profusion open at night, and are strongly sweet-scented. It is a great favourite with Indians and is extensively cultivated in their gardens. This shrub is well adapted for tall borders and screens and can easily be trained on a trellis. It is hardy and drought resistant. Very easily propagated by cuttings.

Cestrum Parqui L'Héritier

WILLOW-LEAVED JASMINE.

(*Parqui* is the Chilean name of this plant and was once proposed as the generic name).

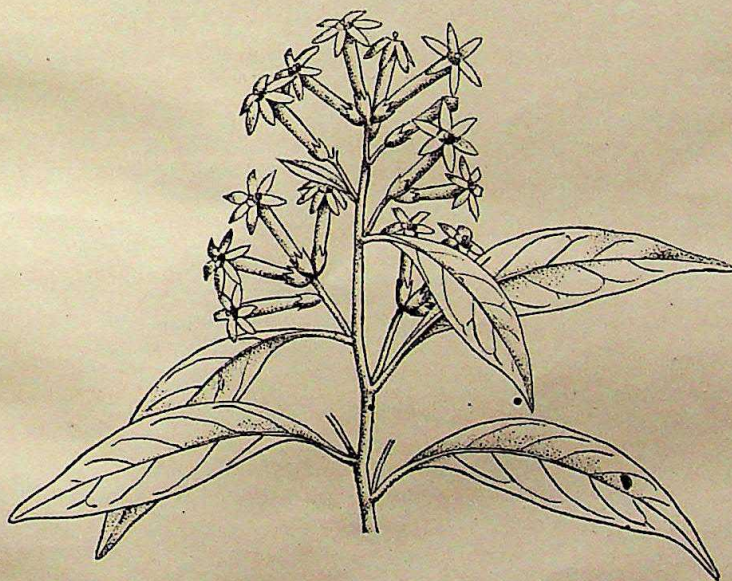


Fig. 5.—*Cestrum Parqui* L'Hérit. $\times 1/2$.

Description.—A shrub reaching 4-5 ft. in height. Branches cylindrical, glabrous, greenish, covered with small greenish-white lenticels. Leaves petioled, alternate, exstipulate, lanceolate, long tapering at the apex, up to 6 in. long, .5-.75 in. wide, very foetid when bruised, entire, glabrous, margins undulate; petioles short, scarcely .1 in. long.

Inflorescence in pedunculate unbelliform cymes or panicles, many-flowered, not exceeding the leaves in length. Individual flowers sessile, supported by a linear bract. Calyx gamosepalous, cylindrical, sparsely glandular without, about .1 in. long, with 5 acute, triangular, ciliate teeth. Corolla gamopetalous, fragrant at night, glabrous, pale yellow in colour, about .75 in. long, narrowly infundibuliform in shape, .15 in. wide at the top. Lobes ovate-acute, ciliate on the margins which become revolute in age, slightly tinged with purple on the outside. Stamens 5; alternate with the lobes of the corolla; filaments inserted on the corolla about $\frac{1}{3}$ its length from the top; stamens globose; appendage absent. Ovary globose, seated on an inconspicuous disk; style elongate, glabrous; stigmas truncate-capitate.

Flowers.—More or less throughout the year. Fruits cold season.

Distribution.—Native in the mountains of Chile, South America, now largely cultivated in the tropical and sub-tropical parts of the globe.

Gardening.—A shrub about 4-5 ft. high, with leaves that have a foetid smell when bruised. The greenish-yellow flowers are very fragrant at night. It was introduced into England in the year 1787. Easily propagated by seed.

(To be continued.)

NOTES ON THE BIRDS OF THE LONDA NEIGHBOURHOOD, BOMBAY PRESIDENCY.

BY

WALTER KOELZ.

In 1938 I spent from January 7 to March 13 in the vicinity of Londa, North Kanara, Bombay Presidency, and among other things, collected birds. The region covered during the course of this collecting was roughly the triangle, about 15 miles on a side, formed by a line joining Londa, Supa and Castle Rock. The area is in the peneplain of the Western Ghats with an average elevation of about 2,000 feet. The terrain consists of worn-down knobs and low hills with well-formed and numerous drainage channels. In general, the mountain-core is covered with earth, with outcroppings only on certain shoulders, and most of the region is forested. The soil on the elevations is generally thin and there the forest growth is scrubby and the species are mainly deciduous. Where the soil is deeper the growths become denser and evergreens become increasingly important. Scattered through most of the area there are small clearings, given over to rice growing, with somewhere at the side, the clustered huts of the cultivators. For the most part, the fields were fallow in winter, for want of water to irrigate them, but in favoured places at the lower levels the rice was being transplanted in February. The largest of these small settlements are Castle Rock and Londa, each with a railroad station, Supa and Jagalbed, all of them with a post office. The only extensive strip of unbroken forest in the delimited area is that between Jagalbed and Supa, and in it there are patches of well-grown trees. One also sees groves of such even among the clearings. There is abundant water in the streams, even in winter, so that crocodiles lived within a stone's throw of the railway station at Londa, and the large river at Supa was far too deep to wade. Ponds were small and rare. Water birds were limited in numbers and of few species, and some widely-distributed species, like ducks, were totally absent. Land birds were plentiful and many of the species were generally distributed and of common occurrence. Only a few were rare. There were few suitable habitats for species like *Saxicoloides fulvata*, *Monticola s. pandoo* and *Rhophodytes viridirostris*, and some like *Ceyx tridactylus*, *Halcyon pileata*, *Dinopium j. malabaricum*, *Arachnothera l. vantlynei*, *Alseonax m. muttui* seemed to prefer relatively restricted parts of major habitats. A few species like *Oreocincla d. neilgherriensis*, *Hippolais c. rama*, *Muscicapa p. albicilla*, *Lalage m. melaschista*, *Ploceus p. travancoreensis*, *Circus pygargus*, *Ducula b. cuprea*, reported from single specimens, may be strays in the region or seasonally absent. *Anthus r. godlewskii* was apparently a short-stay visitor.

Specimens collected are in my collection.

Corvus macrorhynchos calminatus Sykes. The Southern Jungle-Crow.

Occurred in some numbers around the villages.
Wing measurements 3 ♂ 289-304; 3 ♀ 278-301 mm.

Corvus splendens splendens Vieillot. The Common Indian House-Crow.

Occurred with the preceding.
Wing measurements 2 ♂ 267, 270; 3 ♀ 262-264 mm.

Dendrocitta vagabunda. The Indian Tree-Pic.

Common, in pairs in the open jungle. Londa birds are much larger and paler than the Malabar race *parvula* and are darker than *pallida* of the north.

Wing measurements 7 ♂ 143-150; 6 ♀ 140-150 mm.

Machlolophus xanthogenys xanthonotus Koelz¹.

Occurred everywhere except in the dense forest, usually in small flocks or in pairs most often in company with foraging flocks of other birds. These troupes usually contained: *Sitta f. simplex*, *Alcippe p. brucei*, *Egithina i. humei*, *Iole icterica*, *Hemipus p. picatus*, *Tephrodornis g. sylvicola*, *Chaptia a. malayensis*, *Pericrocotus flammeus*, *P. c. cinnamomeus*, *Phylloscopus o. occipitalis*, *P. n. nitidus*, with at least a half dozen of each species. Other species were often to be found also and it was always worthwhile to follow the army as it moved, not too leisurely, in a broad band through the forest. Several such troupes could be found in the course of a half-day's travel. In early morning the members were most conspicuous.

Sitta frontalis simplex Koelz¹.

The species was found frequently, single or in pairs, often in the wandering troupes.

Garrulax delesserti (Jerdon). The Wynaad Laughing-Thrush.

A flock of about a dozen was found in a dense thicket near Castle Rock on March 6 and 7 and three were collected. No others were seen.

Turdoides somervillei malabaricus (Jerdon). The Malabar Jungle Babbler.

This species was abundantly represented in flocks of about a dozen noisy members at the border of fields or throughout the scrub forest. They liked particularly the camps where the oxcart-drivers stopped to refresh themselves and their animals, and were there very tame. I always looked to see what the cause was when they made a special commotion, because elsewhere I have found the species helpful in locating small owls, but here I seldom found out a reason for their excitement and only a few times found a bird, always *Ketupa*.

Wing measurements 4 ♂ 101-106; 6 ♀ (93) 101-109 mm.

Argya subrufa (Jerdon). The Rufous Babbler.

Occurred in flocks of 6-8, most often at the edge of the forest. The birds were as a rule rather quiet and probably were often overlooked. A flock might be found everyday by looking in the right places.

Wing measurements 7 ♂ 90-93; 6 ♀ 88-92.5 mm.

Pomatorhinus horsfieldii travancorensis Harington. The Southern Indian Scimitar-Babbler.

Common in small flocks usually in the thickets but also often in the tree tops with the mixed troupes. They have a variety of notes and their

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India', *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82.

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vocalization is one of the liveliest features of the jungle. Londa birds are similar to my series from the Palnis and Nilgiris.

Wing measurements 8 ♂ (94) 99-101.5; 7 ♀ 88-96 mm.

Dumetia hyperythra albogularis (Blyth). The White-throated Babbler.

Flocks of about 10 were found occasionally, most often in the thickets at the edge of fields or along water.

Wing measurements 8 ♂ (52) 55-57; 8 ♀ 52-55.5 mm.

Pellorneum rufiges rufiges Swainson. The Spotted Babbler.

An abundant species, occurring in pairs, always in the scrub forest. Collected specimens are much like a series from Mahendra Giri, Orissa with a tendency to be somewhat richer in color.

Wing measurements 10 ♂ (70) 73-76; ♀ 66-73 mm.

Alcippe poiocephala-brucei Hume. The Bombay Quaker-Babbler.

One of the common species, found in flocks of 6-10 in deep woods or in open scrub, a common constituent of the mixed troupes. Specimens taken in early March were breeding. Collected specimens are like a series from Mahendra Giri, Orissa.

Wing measurements 4 ♂ 72-73.5; 9 ♀ 66.5-71 mm.

Rhopogchla atriceps atriceps (Jerdon). The Black-headed Babbler.

Like the preceding but not so commonly found in the travelling flocks and more often near the ground. March specimens were nesting.

Wing measurements 4 ♂ 58.5-61; 7 ♀ 56.5-58.5 mm.

Ægithina tiphia humei Stuart Baker. The Central Indian Iora.

One of the common elements of the troupes. Specimens taken prior to March show no black feathers on the body proper.

Wing measurements 8 ♂ 63-66; 6 ♀ 62-63.5 (65) mm.

Chloropsis aurlirons davidsoni Stuart Baker. The Malabar Chloropsis.

Usually occurred in pairs and were found feeding on the *Butea frondosa* blooms.

Wing measurements 10 ♂ (87.5) 91-97; 3 ♀ 86-88.5 mm.

Microscelis psaroides ganesa (Sykes). The Southern Indian Black Bulbul.

I have usually found this and others of its races to occur in flocks, but at Londa I never saw more than pairs. They were not common but occurred throughout the region wherever there were trees.

Wing measurements 10 ♂ 112-120; 3 ♀ 107.5-111 mm.

Molpastes cafer cafer (Linnaeus). The Ceylon Red-vented Bulbul.

This was one of the commonest birds. Usually small flocks were seen, most often in the thickets around fields.

Wing measurements 4 ♂ 91.5-96; 11 ♀ 87.5-90 (92) mm.

Otocompsa jocosca fuscicaudata Gould. The Southern Red-whiskered Bulbul.

Like the preceding, but more numerous. One specimen taken January 26 has only one leg. The stump is completely healed. One ♀ has albino primaries on both wings. One other specimen has the entire plumage stained light brown.

Wing measurements 8 ♂ 84-87; 2 ♀ 80, 81 mm.

Iole icterica icterica (Strickland). The Yellow-browed Bulbul.

This was a common element in the troupes and occurred most often in flocks of 6-10.

Wing measurements 10 ♂ (90) 92-96; 4 ♀ 88.5-90.5 mm.

Pycnonotus gularis (Gould). The Ruby-throated Bulbul.

Only four specimens were taken, though others were seen. The species was rather rare and was seen only in the thickets on low ground along the rivers. Wing measurements ♂ 76; 3 ♀ 70-72 mm.

Pycnonotus luteolus luteolus (Lesson). The White-browed Bulbul.

This species was not seen except at Londa where one or two were found on several occasions in a suitable patch of bushes on a dry slope. The birds stay hidden in the bushes and unless they sing or call they would be overlooked.

Wing measurements 2 ♂ 89, 90 mm.

Microfarsus poiocephalus (Jerdon). The Grey-headed Bulbul.

In the brushy country about Castle Rock the species was rather common. Usually several were found together. Though they stayed hidden in the thickets they were usually calling.

Wing measurements 8 ♂ 76-79.5; 3 ♀ 73.5-77 mm.

Saxicola caprata rupchandi Koelz¹.

Occurred in the fallow fields, in pairs. Common.

Saxicola torquata maura Pallas.

Found in the same situations as the last, but rather rare. Wing measurements 3 ♂ 67-69.5; 2 ♀ 61.5, 66 mm.

Phoenicurus ochruros rufiventris (Vieillot). The Eastern Indian Redstart.

Two females were taken and two others were seen. Wing measurements 83 mm.

Luscinia suecica (Linnaeus).

A few individuals could always be found along the rivers where the beds were half dry and thin bushes and grass offered shelter. Around the fallow fields they also found a suitable habitat. For want of named material of the many Siberian races I am unable to assign a subspecific name to these birds.

Wing measurements 3 ♂ 68, 72, 75; 10 ♀ (67.5) 69-72 mm.

Luscinia pectoralis pectoralis (Gould).

Only a single specimen was observed, a female collected in an old rice field on February 15 (W 75 mm.).

Tarsiger brunnea brunnea (Hodgson). The Indian Blue Chat.

Found singly, usually in the undergrowth of heavy forests, or in heavy undergrowth on damp ground.

Wing measurements 7 ♂ 73.5-80; 4 ♀ 72-75.5 mm.

Saxicoloides fulicata ptymatura (Vieillot). The Indian Black-backed Robin.

Rare, probably because the dry open areas with low stunted bushes that the species likes are not developed in the Londa neighbourhood.

Wing measurements ♂ 76; 2 ♀ 68, 70 mm.

Whistler (J.B.N.H.S., xxxviii, p. 286) has decided Vieillot's name may be used for the race of Southern India. My Londa birds differ from the Ceylonese *fulicata*, *intermedia* of northern Madras Presidency, and the brown-backed race of Northern India. I have seen no specimens from anywhere near Pondicherry, which has been designated as the type locality (l.c.) and it may be that Vieillot's name is not applicable to these specimens.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India', *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82.

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Copsychus saularis saularis (Linnaeus). The Indian Magpie.

Common in pairs, chiefly in the thickets around the edges of fields or along open streams. The specimens taken differ from Bengal birds in having a shorter wing and the females average somewhat darker. They differ more from the Ceylon race *ceylonensis*. Males of the later are possibly more purplish, and have a heavier bill and longer tail and females are darker.

Wing measurements 7 ♂ 95-100.5; 5 ♀ 91.5-94 (97) mm.

Kittacincta malabarica malabarica (Scopoli). The Shama.

Pairs were found not uncommonly, usually where there were bamboo clumps in shade. During the latter part of the collecting period, males were often singing.

Wing measurements 13 ♂ 93-99; 7 ♀ (84) 86.5-91 mm.

Turdus simillimus maharattensis Kinnear and Whistler. The Black-capped Blackbird.

This species was common, mostly in rather dark and damp forest. Usually a small flock was seen.

Wing measurements 7 ♂ 126-133; 8 ♀ (118) 121-126 mm.

Geokichla citrina cyanotus (Jardine and Selby). The White-throated Ground-Thrush.

Scattered individuals were common in the forest, almost always near or on the ground.

Wing measurements 4 ♂ 107-112; 10 ♀ 105-109 mm.

Oreocincla dauma nilgherriensis Blyth. The Nilgiri Thrush.

A single specimen was taken in a dark ravine on January 13 and though I always kept on the look out, no more were seen.

Monticola cinclorhyncha (Vigors). The Blue-headed Rock-Thrush.

Scattered individuals were not uncommon in the dry scrub jungle, often with the travelling troupes.

Wing measurements 10 ♂ (97) 99-106; 11 ♀ 96-103 mm.

Monticola solitaria pandoo (Sykes). The Indian Blue Rock-Thrush.

Two males were collected, the only individuals of the species seen, on March 1 and 12. There are in the Londa neighbourhood low peaks with rock outcroppings, such as this species likes to frequent, but I did not visit them.

Wing measurements 114, 115.5 mm.

Myophonus cœruleus horsfieldii Vigors. The Malabar Whistling Thrush.

The species was found on wet ground in heavy forest only, where it was common. No birds were singing.

Wing measurements 8 ♂ (150) 153.5-158 (168); 9 ♀ 143-151 (155) mm.

Muscicapa parva parva Bechstein. The European Red-breasted Flycatcher.

Individuals were frequently found, usually in the thin brush fringes around the clearings. About half of collected specimens were in immature plumage.

Wing measurements 10 ♂ (65.5) 67-71.5; 7 ♀ 64-67 mm.

Muscicapa parva albicilla Pallas. The Eastern Red-breasted Flycatcher.

An adult male was taken on January 13; Wing 71 mm.

Muscicapula pallipes pallipes (Jerdon). The White-bellied Blue Flycatcher.

Individuals or pairs were commonly found in the low cover of dense shade.

Wing measurements 15 ♂ (73.5) 75-80; 16 ♀ 70.5-74 mm.

Muscicapula rubeculoides rubeculoides (Vigors). The Blue-throated Flycatcher.

The species was rare. It occurred in thickets, usually at the edge of heavy forest. Specimens collected appear indistinguishable from those of a series taken in Bhadwar, Kangra District, Punjab.

Wing measurements 5 ♂ 71.5-77.5; ♀ 68 mm.

Muscicapula tickelliae tickelliae (Blyth). Tickell's Blue Flycatcher.

A common species, usually in the scrub jungle, and elsewhere, mainly in bushes.

Wing measurements 9 ♂ (69) 71-74.5; 12 ♀ 68-72.5 mm.

Eumylas thalassina thalassina (Swainson). The Verditer Flycatcher.

Occasional specimens were found, usually in dense trees, like Mango, most often in clearings.

Wing measurements 5 ♂ 81.5-85 (88.5); 6 ♀ 78-81.5 mm.

Alseonax latirostris poonensis (Sykes). The Indian Brown Flycatcher.

The species was not common. Occasional specimens were found in such situations as *Eumylas* frequented. Collections of this species from various parts of India show curious variations in size and color and only when breeding material is available will it be possible to understand their meaning.

Wing measurements 6 ♂ 69-72; 2 ♀ 67, 69 mm. Breeding birds of Baijnath, Kangra Dt., Punjab: 5 ♂ 69-71.5; 2 ♀ 69, 70 mm.

Alseonax muttui muttui (Layard). Layard's Flycatcher.

Along open streams in thick forest these flycatchers were occasionally found.

Wing measurements 2 ♂ 72, 75; 2 ♀ 67.5, 71 mm.

Tchitrea paradisi paradisi (Linnaeus). The Indian Paradise Flycatcher.

Tchitrea paradisi leucogaster (Swainson)!

Paradise flycatchers were not uncommon and occurred generally, except in the deep forest. Only two specimens of the 10 in female plumage are of the typical race, and two of the 11 adult males. The rest are *leucogaster*.

Hypothymis azurea similis Koelz¹.

A common bird, usually found in thickets and scrub jungle in pairs. It was often associated with the travelling troupes.

Lanius schach erythronotus (Vigors). The Rufous-backed Shrike.

Shrikes were rather common, singly or in pairs, usually in the thickets about fields.

Wing measurements 9 ♂ (92.5) 94-98; 6 ♀ 92-95 mm., as compared with Kulu (virtually topotypical) 12 ♂ (86) 88-95; 2 ♀ 87-89 mm. Strangely, no specimens of *caniceps* were taken, though I have found that race in the Nilgiris and at Udaipur.

Lanius cristatus cristatus Linnaeus. The Brown Shrike.

Occasional specimens were found in all sorts of woody habitats, even in the undergrowth of the dense forest.

Wing measurements 7 ♂ 82-88; 9 ♂ 84.5-88 mm.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India', *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82.

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Hemipus picatus picatus (Sykes). The Black-backed Pied Shrike.

This was one of the common species of the hunting bands; some half dozen were usually found together.

Wing measurements 7 ♂ 60.5-66; 6 ♀ 61-63 mm.

Tephrodornis gularis sylvicola Jerdon. The Malabar Wood-Shrike.

This was one of the common elements of the hunting troupes; often a dozen or more were seen together. When called, they were tame and curious.

Wing measurements 7 ♂ 114.5-120; 9 ♀ 114-119.5 mm.

Tephrodornis pondicerianus warei Koelz¹.

Common in pairs or in small-parties in the thin scrub jungle. Birds taken in early March were getting ready to breed.

Pericrocotus flammeus (Forster). The Orange Minivet.

A common element of the mixed assemblies, usually in small parties.

Wing measurements 12 adult ♂ 87.5-94; 7 ♀ 87-95.5 mm.

Pericrocotus cinnamomeus cinnamomeus (Linnaeus).

About as common as *Tephrodornis p. warei* and of about the same ecological preferences. Specimens taken are like those of Ceylon in color.

Wing measurements 7 ♂ 68.5-71; 5 ♀ 68-71.5 mm.

Lalage melaschista melaschista (Hodgson). The Dark Grey Cuckoo-Shrike.

I got a female on February 8, the only time the species was seen.

Lalage sykesi sykesi Strickland. The Black-headed Cuckoo-Shrike.

Usually found singly, and not uncommonly in the bamboo clumps in more open country.

Wing measurements 13 ♂ (98) 100-106; 8 ♀ 98-103 mm.

Graucalus javensis macei (Lesson). The Large Indian Cuckoo-Shrike.

Rather rare. Seen singly or in pairs in the heavy forest or in the larger trees of the open country.

Wing measurements 4 ♂ 157-161; 2 ♀ 160, 161.5 mm.

Artamus fuscus Vieillot. The Ashy Swallow-Shrike.

Occasional flocks, of up to 8 individuals, were seen in the clearings, where the birds perched on some high dead tree, and from thence hunted flying insects.

Wing measurements 7 ♂ 132-138; 5 ♀ 130-137 mm.

Dicrurus longicaudatus longicaudatus (Jerdon). The Indian Grey Drongo.

Common in small flocks in the scrub jungle. March birds are moulting.

Wing measurements 11 ♂ 128-138 (148); 4 ♀ 127.5-144 mm.

Dicrurus caerulescens caerulescens (Linnaeus). The White-bellied Drongo.

Found in such situations as frequented by the last, but singly or in pairs.

Wing measurements 5 ♂ 116-127; 7 ♀ 115-122.5 mm.

Chaptalia aenea malayensis A. Hay. The Southern Bronzed Drongo.

A common element of the hunting bands, in pairs or small flocks.

Wing measurements 6 ♂ 111.5-122.5; 5 ♀ 111-118 mm.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India', *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82.

Chibia hottentotta londæ Koelz¹.

Not uncommon in the blooming *Bombax* trees.

Dissemurus paradiseus malabaricus (Latham). The Malabar Large Racket-tailed Drongo.

One of the common birds of the forest trees. They occurred in pairs, or sometimes there would be a band of 4 or 5. Immature birds seemed to prefer dense thickets.

Wing measurements 6 ♂ 152-162.5; 7 ♀ 140.5-152.5 mm.

Acrocephalus sientoreus brunnescens (Jerdon). The Indian Great Reed-Warbler.

A single specimen was collected, but several were seen in the grassy edging of a small stream near Supa.

Acrocephalus dumetorum Blyth. Blyth's Reed-Warbler.

One of the common birds, and found in most of the habitats. The series of collected specimens shows more olive, less brown, than birds in fresh fall plumage from Afghanistan, Baltistan and Ladakh.

Acrocephalus agricola agricola Jerdon. The Paddy-field Warbler.

A few birds stayed along the grassy border of a small stream running through rice fields near Londa. Elsewhere none were seen. They are like a topotypical specimen from Madras Presidency.

Wing measurements 4 ♂ 55-58.5 mm. 2 = 7-8, once 6-7.

Orthotomus sutorius londæ Koelz¹.

Tailor-birds occurred not uncommonly in pairs, usually in the dry scrub and along field borders.

Franklinia gracilis albogularis (Walden). The Coorg Wren-Warbler.

The species frequented the open forests and scrub jungle and flocks of about 10 were occasionally seen. I follow Whistler (*J.B.N.H.S.*, xxxviii, p. 468) in using Walden's name as a trinomial, assuming that my specimens are like those of Coorg.

Wing measurements 6 ♂ (43) 45-48.5; 5 ♀ 42-44 (47) mm.

Hippolais caligata annectans Sushkin.

A single specimen (wing 58 mm.) was taken in the scrub jungle on January 18 and though search was regularly made, no more were seen. This bird is darker than specimens I have from Sidhout and Kodur, in the Madras Presidency (topotypical *rama*), and from Sind and Punjab.

Phylloscopus tytleri (Brooks). Tytler's Willow-Warbler.

Occasional specimens seen; two collected.

Phylloscopus nitidus nitidus Blyth. The Green Willow-Warbler.

Recorded only three times, when specimens were taken: January 26, February 27 and March 11.

Wing measurements 2 ♂ 61, 61.5; ♀ 60 mm.

Phylloscopus nitidus viridanus Blyth. The Greenish Willow-Warbler.

A common element of the hunting parties. Specimens taken throughout the season are in worn plumage and some in February were moulting primaries.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India', *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82.

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Phylloscopus magnirostris Blyth. The Large-billed Willow-Warbler.

A rather rare species. Occurred usually in the heavy forest.
Wing measurements 2 ♂ 64; 5 ♀ 58.5-64.5 mm.

Phylloscopus occipitalis occipitalis (Blyth.). The Large Crowned Willow-Warbler.

A common element of the hunting parties. All specimens collected were males.

Wing measurements 17 ♂ 64-70 mm.

Irena puella puella (Latham). The Fairy Blue-bird.

A common bird of the forest, often with the hunting parties, and in the fig trees, eating the ripe fruits, along with Orioles, Barbets, *Piprisoma*, Fruit Pigeons, Starlings, Mynas, Hornbills, Bulbuls, *Turdus*. Often a half dozen or so occurred together.

Wing measurements 9 ♂ 123-129; 7 ♀ 117.5-126.5 mm.

A male taken on March 12 had testes enlarged to breeding condition.

Oriolus oriolus kundoo Sykes. The Indian Oriole.

Orioles were found commonly, feeding on the fruits of the various species of figs, and often also in the flowering *Bombax* trees.

Wing measurements 6 ♂ 135-147; 6 ♀ 133-143 mm.

Oriolus chinensis diffusus Sharpe. The Indian Black-naped Oriole.

A single female (wing 147 mm.) was collected on February 3. No others were seen.

Oriolus xanthornus maderaspatanus Franklin. The South Indian Black-headed Oriole.

Found usually in the scrub jungle and around clearings.

Fed less commonly on the figs than *O. o. kundoo*.

Wing measurements 10 ♂ 129-140; 2 ♀ 131 mm.

Eulabes religiosa indica (Cuvier). The Southern Grackle.

The species was not common till mid February, and thereafter flocks of 2-20 or so were often seen, usually in the fig- or *Bombax* trees. Specimens appear to be of the Ceylonese race.

Wing measurements 10 ♂ 137-146; 5 ♀ 136-140 mm.

Pastor roseus (Linnaeus). The Rosy Pastor or Rose-coloured Starling.

Pastors occurred in parties of half dozen, or even singly, mainly in the fields.

Wing measurements 4 ♂ 127.5-130.5; ♀ 123.5 mm.

Sturnia malabarica malabarica (Gmelin). The Grey-headed Myna.

Sturnia malabarica blythii (Jerdon). Blyth's Myna.

The species occurred in flocks, often of 25 or more, and were frequently seen in the flowering *Butea* trees. Most of the individuals collected belong to the race *blythii*.

Temenuchus pagodarum sylvestris (Hodgson).

Like the Rosy Pastors, this species kept to the fields. It occurred in small groups like that form, but was more often met. It fed in the *Bombax* often, but rarely in the fig trees.

Wing measurements 5 ♂ 106-110; 5 ♀ 99-104 mm.

Acridotheres tristis tristis (Linnaeus). The Common Myna.

In habits and abundance like the last, except that it was often seen eating figs. Specimens taken are not in fresh plumage and are lighter and more vinous than fresh Afghan birds.

Wing measurements 6 ♂ 148-153; 6 ♀ 139-147 mm.

Æthiopsar fuscus mahrattensis (Sykes). The Southern Jungle Myna.

Commoner than the last; common in the fig trees.

Wing measurements 6 ♂ 126-129; 5 ♀ 121-126 mm.

Ploceus philippinus travancoreensis Whistler. The Travancore Baya or Weaver-Bird.

A single record: a male (wing 71 mm.) taken in a sugar cane patch on January 19.

Lonchura striata estriata Koelz¹.

This was a common bird in the open scrub jungle and in the fields. Flocks were met usually containing birds in mature and immature plumage, both usually in moult. Breeding specimens were, however, taken throughout our stay.

Lonchura punctulata lineoventer (Hodgson). The Spotted Munia.

This species also occurred in flocks of adult and juvenile birds and none of them were in stable plumage. Moult had usually just begun and in adults the primaries were much frayed. Clearings were the favorite habitats and the Lantana berries were approved food.

Wing measurements 10 ♂ 53-58; 8 ♀ 53-59 mm.

Erythrina erythrina kubanensis (Laubmann).

Common in flocks of up to about 25, usually about clearings. They often fed on the blooms of *Butea frondosa*. I have seen an adult male of *kubanensis* from the Caucasus in the collection of the Museum of Comparative Zoology which fits into the series of specimens collected from Londa and from the mountain districts of the Punjab, Ladakh and Afghanistan. *Roseatus* is a more saturated form that breeds farther east and occurs in winter in the Nilgiris and Palnis.

Gymnoris xanthocollis xanthocollis (Burton). The Yellow-throated Sparrow.

Common in the scrub jungle and about the clearings. Breeding had begun in late February.

Wing measurements 10 ♂ 81-89; 6 ♀ 78-81 mm.

Passer domesticus indicus Jardine and Selby. The Indian House-Sparrow.

Except at Londa, there were few House Sparrows, probably because the native house architecture is too simple to afford them shelter.

Wing measurements 4 ♂ 70.5-74 mm.

Riparia rupestris (Scopoli). The Crag-Martin.

An occasional specimen was seen in the air near Castle Rock in early March.

Riparia concolor (Sykes). The Dusky Crag-Martin.

Seen in pairs, most often around railroad bridges.

Wing measurements ♂ 109; ♀ 107 mm.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India', *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82.

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Hirundo smithii filifera Stephens. The Indian Wire-tailed Swallow.

A common species, often seen in early morning on the telegraph wires beside a clearing. Breeding had begun in mid January.

Wing measurements 5 ♂ 112-118; 5 ♀ 111-114 mm.

Birds from North India and Afghanistan average larger. The intensity of head color is variable.

Hirundo daurica nipalensis Hodgson. Hodgson's Striated Swallow.

The commonest swallow. Large flocks often were hunting over the clearings or resting on the telegraph wires. Sometimes swarming ants would cause a congregation to spend hours over a forest area. Mostly the individuals taken were in various stages of moult.

Wing measurements 8 ♂ (105) 112-119; 4 ♀ 113-117.5 mm.

Hirundo daurica erythropygia Sykes. Sykes's Striated Swallow.

A female (wing 108 mm.) that appears to be of this race was taken on January 11.

Motacilla alba dukhunensis Sykes. The Indian White Wagtail.

Species of *Motacilla*, along with *Dendronanthus* and *Cyanosylvia* came in large numbers to roost in a small patch of sugar cane near Londa. The various forms probably came from afar because some of them were rarely seen during the day.

This was not a common Wagtail but one or a few could usually be found in some wet rice fields. Specimens taken in March were moulting to breeding dress.

Wing measurements ♂ 90.5; 5 ♀ 83.5-88 mm.

Motacilla alba personata Gould. The Masked Wagtail.

Rather rarer than the last.

Wing measurements ♂ 91; 3 ♀ 88 mm.

Motacilla maderaspatensis maderaspatensis Gmelin. The Large Pied Wagtail.

A common form, found in pairs, usually along the larger streams with open banks. March birds were breeding.

Wing measurements 7 ♂ 97-101.5; 6 ♀ 92-97.5 mm.

Motacilla cinerea caspica (Gmelin). The Eastern Grey Wagtail.

Found in such situations as frequented by the last, but singly or in pairs.

Wing measurements ♂ 84; 10 ♀ 78-82 mm.

Motacilla flava beema Sykes. The Indian Blue-headed Wagtail.

Rather common in the dry rice fields. A few of the specimens, all in winter dress, have a yellowish supercilium.

Motacilla flava thunbergi Billberg. The Grey-headed Wagtail.

Rather abundant in the roosting parties.

Wing measurements 2 ♂ 82 mm.

Motacilla citreola weræ Buturlin.

One of the commonest Wagtails. Specimens were mostly in immature plumage.

Wing measurements 7 ♂ 80-83; 2 ♀ 72, 78 mm.

Dendronanthus indica (Gmelin). The Forest Wagtail.

Abundant in the roosting parties and rather common in the open forest and along streams where a few could be flushed from the ground. Usually they were very shy in the day time.

Wing measurements 10 ♂ 79-83; 6 ♀ 76-81.5 mm.

Anthus trivialis trivialis (Linnaeus). The Tree-Pipit.

Flocks of up to about 10 individuals were common in the clearings. Most of the specimens taken were moulting.

Wing measurements 4 ♂ 86-90; 13 ♀ 83-86 (89) mm.

Anthus hodgsoni inopinatus Hartert and Steinbacher.

Common in flocks like the last, but in the scrub jungle, not in the openings.

Wing measurements 6 ♂ 84-88; 7 ♀ 80-85 mm.

Anthus rufulus malayensis Eyton. The Malay Pipit.

Common in pairs in the fields. Breeding had begun in early January.

Wing measurements 11 ♂ 80.5-84; 2 ♀ 79, 81 mm.

Anthus campestris godlewskii Taczanowski.

Seen only on the pasture plain at Jagalbed, where a flock of perhaps 20 arrived on March 9.

Wing measurements 3 ♂ 92-94 mm.

Galerida malabarica propinqua Koelz¹.

Common in pairs in the fields. Birds were breeding all during our stay, and on January 27 a full fledged young was collected.

Zosterops palpebrosa salimalii Whistler. The White-eye.

Not found until mid February when it was common in certain blooming trees in the scrub forest.

Wing measurements 10 ♂ 53-56; 4 ♀ 52-55 mm.

Leptocoma lotenia (Linnaeus). Loten's Sunbird.

Rare except in the scrub jungle around Castle Rock where breeding pairs were found in early March.

Wing measurements 3 ♂ 57-58.5; 2 ♀ 54, 55 mm.

Leptocoma asiatica brevirostris (Blanford). The Sind Purple Sunbird.

Common. They frequented the *Butea frondosa* blooms as well as the less showy flowers of forest trees, shrubs and climbers. Some specimens were breeding all during our stay and full fledged young were seen and collected. Some males taken were not yet in full plumage in early March and many were in full plumage on our arrival.

Wing measurements 16 ♂ 54.5-59; 8 ♀ 51-54.5 mm.

I have 16 males and 8 females from Londa, mostly in adult plumage, except that four of the January males are moulting to adult plumage and one March bird has not completed the change. Compared with 4 adult males and a female from Kalaigulaman, Afghanistan and a series from Sind (*brevirostris*), 11 males, including all the immature ones and 6 females (one juvenile) have bills that match closely in length and depth those of Sind and Afghanistan.

I have a pair of birds from Dacca, Bengal which should be *intermedia*, and a pair from Patna, Bihar, a male from Benares, U.P., and a female from near Darjeeling which may be like typical *asiatica*=Gurgaon. These birds have heavier, not longer bills, than the 6 males and a female from Londa that do not match the *brevirostris* just mentioned. I can see no color differences in the males of these groups, but the female from Dacca and that from Darjeeling are richer yellow below than any of the others, except juveniles from Londa. It may be that *brevirostris* is distinguished by a somewhat weaker bill and extends along the west coast of India, and that *intermedia* is separable by richer color of females, not males.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India', *Proc. Biol. Soc. Washington*, 52, June 5, 1939, pp. 61-82.

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Leptocoma minima (Sykes). The Small Sunbird.

Common, and found like the last, except that it did not frequent the *Butea* trees. Specimens taken in mid February were breeding.

Wing measurements 14 ♂ 44-48; 9 ♀ 42.5-45.5 mm.

Leptocoma zeylonica (Linnaeus). The Purple-rumped Sunbird.

Found mostly in the scrub jungle and not so common as the two last.

Wing measurements 5 ♂ 54-56; 2 ♀ 54 mm.

Arachnothera longirostra vantlynei Koelz¹.

Rare. Breeding pairs were found in March in the heavy jungle of the river bottoms near Supa and Castle Rock.

Dicaeum concolor subflavum Stuart Baker. The Belgaum Flower-pecker.

A common bird feeding chiefly in the *Loranthus*. Specimens taken in early March were breeding. Whistler (*J.B.N.H.S.*, xxxvii, p. 284) is probably right in considering *subflavum* a synonym of *concolor*. These specimens are virtually topotypical and are like birds from the foothills of the Nilgiris, except possibly they are paler.

Wing measurements 6 ♂ 45-49; 11 ♀ 44-47 mm.

Piprisoma agile saturator Koelz¹.

Not uncommon. Fed on the flowers, like *Leptocoma asiatica*, but also on the figs. Specimens taken in early March were breeding.

Pitta brachyura brachyura (Linnaeus). The Indian Pitta.

Rare, though there were extensive habitats, apparently suitable.

Wing measurements 2 ♂ 108, 109 mm.

Picus chlorolophus chlorigaster Jerdon. The Southern Indian Small Yellow-naped Woodpecker.

Found singly or in pairs in the forest. Sometimes not met for several days.

Wing measurements 10 ♂ 120-127.5; 8 ♀ 120-127 mm.

Dryobates mahrattensis mahrattensis (Latham). The Southern Yellow-fronted Pied Woodpecker.

Not uncommon, in pairs, in the scrub jungle.

Wing measurements 6 ♂ 98-103; 3 ♀ 99-101 mm.

Dryobates hardwickii hardwickii (Jerdon). The Southern Indian Pigmy Woodpecker.

Rather common, singly or in pairs in the forest, often with the hunting parties.

Wing measurements 8 ♂ 74-77.5; 4 ♀ 75-78 mm.

Micropternus brachyurus jerdonii (Malherbe). The Southern Rufous Woodpecker.

Rather common, in pairs, in the forest. They were often seen attacking the paper nests of ant colonies in the bamboo.

Wing measurements 8 ♂ 126-131, 8 ♀ 125-130.5 mm.

Brachypternus benghalensis woodi Koelz¹.

Not uncommon, usually at the edge of clearings.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India', *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82.

Dinopium javanense malabaricum Kinnear and Whistler. The Malabar Golden-backed Three-toed Woodpecker.

Found only in the heavy forest of the river bottoms. There it was not uncommon, singly or in pairs.

Wing measurements 4 ♂ 138.5-143; 3 ♀ 139-143 mm.

Chrysocolaptes guttacristatus socialis Koelz.

Probably the commonest and also most conspicuous woodpecker, usually found in pairs, or often in groups of up to 6, in the forest or scrub jungle. On February 23 a male in first plumage was taken.

Wing measurements 10 ♂ 152-159; 8 ♀ 152-162 mm.

Hemicircus canente cordatus Jerdon. The Malabar Heart-spotted Woodpecker.

Common, singly or in pairs in the scrub jungle.

Wing measurements 8 ♂ 92-97; 8 ♀ 88-93 mm.

Macropicus javensis hodgsonii (Jerdon). The Malabar Great Black Woodpecker.

Occasionally found in the clearings, or scrub jungle, singly or in pairs. The birds were not noisy and must often have been overlooked. Excavations probably made by them were common enough.

Wing measurements 4 ♂ 213-220; 2 ♀ 224, 226 mm.

Vivia innominatus (Hartert).

Rare, only 3 specimens observed. A female taken on January 30 was laying.

Wing measurements 3 ♀ 58-60 mm.

Thereiceryx viridis (Boddaert). The Small Green Barbet.

A common bird. They fed extensively on figs. Birds taken in late January were beginning to breed.

Wing measurements 6 ♂ 97-104; 5 ♀ (92) 100-102 mm.

Xantholæma hæmacephala confusa Koelz¹.

Not common and seen only in January when they were feeding on figs. Specimens taken were in breeding condition.

Xantholæma malabarica (Blyth). The Crimson-throated Barbet.

A common species, always to be found among the ripe figs. Breeding specimens were taken from mid January.

Wing measurements 9 ♂ 78-83.5; 4 ♀ 79-82 mm.

Penthoceryx sonneratii sonneratii Latham. The Banded Bay Cuckoo.

Not noticed until late February, when the call was occasionally heard. In March the birds were noisier and they called commonly in the heavy forest around Jagalbed.

Wing measurements 2 ♂ 121.5, 123.5 mm.

Eudynamis scolopaceus scolopaceus (Linnaeus). The Indian Koel.

Considered rare until March when their calls were heard frequently. The favourite habitat appeared to be mango trees in the clearings.

Wing measurements 3 ♂ 187-194; 3 ♀ 178.5-186 mm.

Rhopodytes viridirostris (Jerdon). The Small Green-billed Malkoha.

Rarely seen, then singly or in pairs. They frequented the openings with dense Lantana growths where pursuit of them was impossible.

Wing measurements ♂ 135 mm.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India', *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp 61-82.

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Centropus sinensis parroti Stresemann. The Southern Crow-Pheasant.

Rather common. Occurred usually in the thickets along clearings and along streams.

Wing measurements 8 ♂ 177-196; 3 ♀ 191-213 mm.

• **Psittacula krameri borealis** Neumann. The Eastern Rose-ringed Paroquet.

Not common, the pairs or even small flocks were occasionally seen in the *Bombar* or *Butea* trees. Collected specimens have as large a wing as Punjab specimens, which Whistler (*J.B.N.H.S.*, xxxvii, p. 752) says should be called *borealis*.

Wing measurements 3 ♂ 175-178; ♀ 164 mm.; 9 adult ♂ 170-179 (186); ♀ 169 mm., from Sira, Hissar Dt. and Bhadwar, Kangra Dt.

Psittacula cyanocephala cyanocephala (Linnaeus). The Western Blossom-headed Paroquet.

Common. Often seen in the *Butea frondosa* where it fed on flowers and seeds. A female taken on February 14 had nearly all the body-feathers worn to the midrib, with no moult. A young male taken on March 4 shows only a few rosy feathers over the right eye. Breeding specimens were taken in late January. Collected specimens have longer tails than Ceylon birds, and are not so yellow below.

Wing measurements 5 adult ♂ 137.5-143.5; 6 ♀ 128-137.5 mm.

Psittacula columboides (Vigors). The Blue-winged Paroquet.

Not seen except in the extensive forests about Jagalbed. They often fed in the fig trees, but it was difficult to approach them.

Wing measurements 2 ♂ 143, 144; 4 ♀ 134-140 mm.

Coryllis vernalis rubropygius Stuart Baker. The Malabar Loriquet.

Not uncommon; most often seen in the fig trees. Pairs were usually found together. Specimens taken in March were breeding.

Wing measurements 12 ♂ 86-96; 4 ♀ 91-95.5 mm.

Coracias benghalensis indica Linnaeus. The Southern Indian Roller.

Not uncommon in the open country.

Wing measurements 5 ♂ 179-183; 3 ♀ 176-179 mm.

Merops orientalis orientalis Latham. The Common Indian Bee-eater.

Common in the open country, often in pairs or small flocks.

Wing measurements 5 ♂ 93-96.5; 9 ♀ 90-92.5 mm.

Merops superciliosus javanicus Horsfield. The Blue-tailed Bee-eater.

Rather common in the river bottoms where they hunted from the tips of tall bamboos or dry trees. The birds were usually in parties of up to half dozen.

Wing measurements 3 ♂ 131-134; 5 ♀ 120.5-126.5 mm.

• **Merops leschenaulti leschenaulti** Vieillot. The Chestnut-headed Bee-eater.

Found with the last, likewise in parties; probably more numerous.

Wing measurements 7 ♂ 105-110.5; 8 ♀ 104-107.5 mm.

Alcemerops athertoni athertoni (Jardine and Selby). The Blue-bearded Bee-eater.

Seen but three times, singly, always in the heavy timber.

Wing measurements ♂ 135 mm.

Ceryle rudis leucomelanura Reichenbach. The Indian Pied Kingfisher.

Frequented the large streams, such as the Crocodiles lived in. As Kingfishers go, not rare. Specimens of late January had sex organs in breeding condition. The plumage is somewhat worn but it seems that the amount of

white is probably as in the typical Ceylonese form. The black is not so sooty as in the Travancore race *travancorensis*.

Wing measurements 4 ♂ 134-138; 3 ♀ 140-145 mm.

Alcedo atthis bengalensis Gmelin. The Common Indian Kingfisher.

Alcedo atthis taprobana Kleinschmidt.

Found along the streams, large and small, open or in the heavy forest. Of 15 specimens collected only 3 belong to the richly-coloured race, *taprobana*, unless they should be immature.

Wing measurements 7 ♂ 68.5-71; 3 ♀ 69.5-71 mm. and 3 ♂ 68-71.5 mm., respectively.

Alcedo meninting aslatika Swainson. Beavan's Kingfisher.

Rather uncommon. Found almost exclusively along the streams in heavy cover.

Ceyx tridactylus tridactylus (Pallas). The Three-toed Kingfisher.

Found only in the heavy forest along nearly dry trickles where it fed on crustaceans, etc.

Wing ♂ 56, 2 ♀ 58.5 mm.

Specimens appear indistinguishable from those from Sikkim, Malay and Hainan.

Ramphalcyon capensis gural (Pearson). The Brown-headed Stork-billed Kingfisher.

Found along the larger more open streams. One of the common Kingfishers. Wing measurements 3 ♂ 147-153; 3 ♀ 155-162.5 mm.

Halcyon smyrnensis fusca (Boddaert). The Indian White-breasted Kingfisher.

A common Kingfisher, found in fish-producing waters more frequently than usual.

Wing measurements 7 ♂ 115.5-123.5; 8 ♀ 118-124 mm.

Halcyon pileata Boddaert. The Black-capped Kingfisher.

Rare and found only in growing ricefields around Supa.

Wing measurements 2 ♂ 131.5, 132 mm.

These specimens average somewhat darker than Chinese birds.

Dichoceros bicornis (Linnaeus). The Great Indian Hornbill.

A single specimen was seen at Jagalbed on February 25.

Hydrocissa coronatus (Boddaert). The Malabar Pied Hornbill.

Not rare in the heavy timber, often in flocks of 20 or so, when feeding or roosting. They were often noisy and always shy.

Wing measurements ♂ 332; 3 ♀ 290-309 mm.

Tockus birostris birostris (Scopoli). The Common Grey Hornbill.

One was collected and one other seen.

Wing measurements ♀ 202 mm.

Tockus griseus griseus (Latham). The Malabar Grey Hornbill.

Common, in pairs, usually in the lighter, drier forests. They fed heavily on the various figs. When travelling they were often noisy. Their call is like crazy laughter.

Wing measurements 2 ♂ 211, 218; 8 ♀ 185-193 mm.

Upupa epops epops Linnaeus. The European Hoopoe.

Two females were collected, one February 24, one March 7.

Wing measurements 139.5, 144 mm.

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Upupa epops ceylonensis Reichenbach. The Ceylon Hoopoe.

Rather rare, usually in pairs. February birds showed swelling gonads.
Wing measurements 6 ♂ 122-142; ♀ 122 mm.

Harpactes fasciatus malabaricus (Gould). The Malabar Trogon.

Common, usually in pairs, in the dry forest.

Wing measurements 9 ♂ 123-129; 6 ♀ 123-131 mm.

Apus melba. The Alpine Swift.

Large flocks passed regularly over the town of Londa, headed south, at about 8.30 a.m. They were usually out of gun range and none were ever taken.

Indicapus sylvaticus (Tickell). The White-rumped Spinetail.

Rather local and in small colonies. They were nesting in February in holes in dead palms (*Caryota urens*).

Wing measurements ♂ 113; ♀ 112-116 mm.

Hemiprocne coronata (Tickell). The Indian Crested Swift.

Not uncommon. Seen hawking over the fields with the swallows or travelling in the higher strata.

Wing measurements 3 ♂ 146-155; ♀ 157.5 mm.

Caprimulgus macrourus atripennis Jerdon. Jerdon's Long-tailed Nightjar.

Rather common. Seen most often at night sitting on the ground in the fields. In the day time specimens were most often found on the ground in the scrub jungle.

Wing measurements 4 ♂ 170-181; 3 ♀ 175-186 mm.

Caprimulgus indicus indicus Latham. The Indian Jungle Nightjar.

About like the last.

Wing measurements 6 ♂ 182-191.5; 5 ♀ 185-191.5 mm.

Caprimulgus monticolus monticolus Franklin. Franklin's Nightjar.

Commonest of the Goatsuckers and found with the others.

Wing measurements 6 ♂ 187-201.5; 12 ♀ 182.5-196 mm.

Tyto alba crypta Koelz¹.

Only 3 specimens seen, taken from under a railroad bridge on January 26, 27 and 29.

Wing measurements 2 ♂ 262, 297; ♀ 293 mm.

Strix indraneae indraneae Sykes. The Brown Wood-Owl.

Found only in the heavy forest. Only one specimen was obtained.

Ketupa zeylonensis zeylonensis (Gmelin). The Ceylon Brown Fish-Owl.

A common species that was usually found in pairs. Food consisted mainly of fish and crustaceans, but one individual had eaten a small mammal.

Wing measurements 7 ♂ 355-398; 3 ♀ 370-379 mm.

These skins appear as dark as Ceylonese.

Bubo bengalensis (Franklin). The Indian Great Horned-Owl.

One could be heard calling occasionally at night but none were ever seen.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India' *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82.

Otus bakkamœna bakkamœna Pennant. The Ceylon Collared Scops Owl.

Around Jagalbed in late February and early March birds could be heard commonly, but they kept to the bamboos and few were seen.
Wing measurements ♀ 148 mm.

Otus sunia rufipennis (Sharpe). The Indian Scops Owl.

Probably commoner than the last. At Jagalbed sometimes four could be heard from camp. They began singing in late January. They often sang from the mango trees and sometimes could be heard in the day time in the bamboo.
Wing measurements ♂ 127 mm.

Glaucidium radiatum. The Jungle Owlet.

Not common, but after January one could be heard almost every night. In March they began to sing in the day time. Two males were taken (wing 131 mm.). They are intermediate in color between *radiatum* and *malabaricum*.

Sarcogyps calvus (Scopoli). The Black Pondicherry or King Vulture.

Occasionally seen at camp, attracted by refuse. Usually single individuals came, sometimes 3. They were shy and only one was killed.

Gyps fulvus fulvescens Hume. The Indian Griffon Vulture.

Observed only at Jagalbed when on February 18 some 50 had gathered at a carcass. One was collected.

Pseudogyps bengalensis (Gmelin). The White-backed or Bengal Vulture.

The common Vulture that always came to camp for bird meat. One was preserved.

Neophron percnopterus (Linnaeus). The Egyptian or Large White, Scavenger Vulture.

Rare and only an occasional individual was seen; none killed.

Falco tinnunculus objurgatus Stuart Baker. The Indian Kestrel.

Kestrels were not common but an individual or two could usually be found in a day's walking, usually in large clearings. Of four pairs collected, all but one male may be referable to the heavily-barred race *objurgatus*. The exception may be *tinnunculus*. Food of four specimens was insects, mainly Orthoptera. Two had eaten skinks.

Wing measurements 4 ♂ 233-248; 4 ♀ 247-263 mm.

Aquila rapax vindhiana Franklin. The Indian Tawny Eagle.

Judged by experience in Sind and the Punjab, the bird was rare. Occasionally one came to camp and sometimes 2 or 3 could be seen soaring. Only one was killed.

Aquila clanga Pallas. The Greater Spotted Eagle.

Rare. Only one taken.

Lophotriorchis kienerii kienerii (Sparre). The Rufous-bellied Hawk-Eagle.

Only one specimen seen, one taken on February 21. It flew out to pick up a bird. The feathers of one were found around a village later.

Spizaetus cirrhatus ceylanensis (Gmelin). The Ceylon Crested Hawk-Eagle.

Not common and usually very shy. Male taken on January 21, wing 384 mm.

Spilornis cheela melanotis (Jerdon). The Crested Serpent Eagle.

One of the commonest hawks. Often a pair stayed together. The birds sometimes were seen soaring about, high up, but more often came to notice from their habit of screaming when perched on some high vantage point.

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They never screamed when resting in dense foliage. Is it possible that snakes respond to the vibrations of their cry? Food of specimens taken was often snakes, but as often skinks, once a large grasshopper and once a large mantis. A male taken on March 9 had testes in breeding condition. Only one bird in immature whitebreasted plumage was taken.

Wing measurements 6 ♂ 411-430; 6 ♀ 405-431 mm.

Buteo teesa (Franklin). The White-eyed Buzzard-Eagle.

A common species, found most often about the fields. Specimens taken were adults and birds in immature plumage. Food was most often frogs or skinks. One had eaten mice.

Wing measurements 5 ♂ 279-291; 9 ♀ 288-317 mm.

Haliastur indus indus (Boddaert). The Brahminy Kite.

Not common. I have found the species most commonly in marshes or pools. and such habitats about Londa were rare. Specimens taken had eaten mostly shrimps and frogs, but one had eaten an *Ardeola grayii*.

Wing measurements ♂ 391; 4 ♀ 378-414 mm.

Milvus migrans govinda Sykes. The Common Pariah Kite.

Common. One collected, ♀ wing 419 mm.

Milvus migrans lineatus (Gray). The Black-eared Kite or Large Indian Kite.

Three females were taken, wing 459, 491, 510 mm.

Elanus caeruleus vociferus (Latham). The Black-winged Kite.

Rather rare. An occasional specimen was found where there was a high dead limb to perch on in a clearing growing up to bushes.

Wing measurements ♂ 257; 2 ♀ 268, 270 mm.

Circus macrourus (S. G. Gmelin). The Pale Harrier.

Rather common. Harriers of all species were seen hunting over the fields or resting in the trees at their edge. Specimens collected had no food or had eaten birds.

Wing measurements 2 ♂ 325, 355; 6 ♀ 355-370 mm.

Circus pygargus Linnaeus. Montague's Harrier.

A single specimen taken, ♀, wing 379 mm. Food: grasshoppers.

Circus melanoleucos (Pennant). The Pied Harrier.

A single specimen, ♂ in immature dress, was taken.

Wing 344 mm. Food insects.

Circus aeruginosus aeruginosus (Linnaeus). The Marsh-Harrier.

Not so common as *C. macrourus* and seen most often around the wet fields near Supa.

Wing measurements juv. ♂ 393; ad. ♀ 395 mm.

Accipiter badius dussumieri (Temminck). The Indian Shikra.

Rather common. Found usually in the clearings, most often along streams, where it fed on insects and skinks. Only one specimen had eaten birds: a Munia. In late February birds with sex organs in breeding condition were collected.

Wing measurements 12 ♂ 173-199; 9 ♀ 199-209 mm.

Accipiter trivirgatus trivirgatus (Temminck). The Crested Goshawk.

Not uncommon, usually in the forest where it was oftenest found perched in a tree. All specimens taken had eaten only birds. One had eaten a *Gallus sonneratii* cock and one a *Galloperdix*.

Wing measurements 2 ♂ 202, 210; 6 ♀ 225-237 mm.

In size the specimens are apparently intermediate with *rufitinctus*.

Accipiter nisus nisosimilis (Tickeñ). The Asiatic Sparrow-Hawk.

Rare.

Wing measurements 2 ♂ 202, 212; ♀ 250.5 mm.

Accipiter virgatus besra Jerdon. The Southern Besra Sparrow-Hawk.

Of the same habitat preferences as *A. trivirgatus*, but not found so commonly.

Wing measurements ♂ 158.5; 3 ♀ 185-188 mm.

Pernis ptilorhynchus ruficollis Lesson. The Indian Crested Honey Buzzard.

Probably not uncommon in the heavy forest. Four specimens taken differ in plumage, and vary from the form with dark underparts to the form with white streaked underparts. These can be matched phase for phase in a series of skins from the Kangra District, Punjab, and it may be that the various stages of plumage reflect age. Food: bees, larvae, comb, are usual. Three birds taken in March were breeding.

Wing measurements 2 ♂ 403, 419, 2 ♀ 420, 421 mm.

Crocopus phœnicopterus chlorigaster (Blyth). The Southern Green Pigeon.

Rare. Pairs were seen on three occasions in late January, all breeding birds. They fed on fig fruit, as did all the other Fruit Pigeons.

Wing measurements 2 ♂ 183, 190; ♀ 178.5 mm.

Dendrophassa pompadora affinis (Jerdon). The Grey-fronted Green Pigeon.

The commonest of the Fruit Pigeons. In favourable fig trees flocks of 20-30 congregated to feed on the fruits, specimens taken in late January were breeding.

Wing measurements 10 ♂ 137.5-147; 5 ♀ 142-149 mm.

Ducula badia cuprea (Jerdon). Jerdon's Imperial Pigeon.

A single bird (♀, wing 218 mm.), was noted.

Muscadivora ænea pusilla (Blyth). The Ceylon Imperial Green Pigeon.

Common in the heavy forest. Flocks of up to 25 used to feed in certain lofty trees. I never saw them eating figs. They were shy when feeding and could usually be killed only when flying to feed in the morning. One specimen in mature plumage dissected almost immediately on killing had no trace of sex organs. Specimens are intermediate in size with *sylvatica*.

Wing measurements 3 ♂ 222-226; 6 ♀ 213-225 mm.

Chalcophaps indica indica (Linnaeus). The Indian Emerald Dove.

Not rare in the heavy forest. They were oftenest seen as pairs or individuals feeding on the forest roads. Specimens taken average more bronzed than those from Malay and east.

Wing measurements 3 ♂ 146-154; 5 ♀ 135-148 mm.

Streptopelia orientalis meena (Sykes). The Indian Rufous Turtle-Dove.

Common. During the warm part of the day small flocks stayed together, usually in the mango trees along streams. They fed mornings and afternoons in the dry ricefields and were always shy. Specimens taken resemble breeding birds of Lahul, Punjab.

Wing measurements 8 ♂ 185-193; 8 ♀ 179-195 mm.

Streptopelia orientalis sylvicola Koelz¹.

This race was found only in the Castle Rock area where they were breeding in country covered with thick evergreen bushes and feeding with the preceding in the rice fields.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India' *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82.

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Streptopelia chinensis suratensis (Gmelin). The Indian Spotted Dove.

Common. Flocks were often seen feeding in the rice fields. Collected specimens are in juvenile plumage, or are adults, the last for the most part breeding.

Wing measurements 5 adult ♂ 130.5-145; 5 juvenile ♂ 126-133; 9 adult ♀ 127-137.5; 4 juvenile ♀ 129-134 mm.

Pavo cristatus Linnaeus. The Common Peafowl.

The natives said peafowl occurred in certain places in the district but we saw no evidence of them.

Gallus sonneratii Temminck. The Grey Jungle-Fowl.

Common, singly or in small groups, and exceedingly wary around human habitations. Only along the road through the heavy forest was it possible to collect specimens at all easily.

Wing measurements 6 ad. ♂ 225-247; 3 ♀ 187-196 mm.

Gallus padana (Gmelin). The Red Spur-Fowl.

Common, in pairs; wary. Spur-fowls keep to more open country than the junglefowls and were most often seen in the scrub.

Wing measurements 6 ♂ 147-156; 4 ♀ 141-151 mm.

Pardaliparus asiatica Whistler.

Common in small flocks in the grassy scrub.

Wing measurements 8 ♂ 83.5-99; 3 ♀ 80-83 mm.

Amurornis phaeopus phaeopus (Pennant). The White-breasted Water-Hen.

Commonly seen along the small streams. When disturbed they either ran for cover or flew into a thick bamboo and climbed about in the interior.

Metopidius indicus (Latham). The Bronze-winged Jacana.

One was collected at a little weedy pool near Londa on February 14.

Gallinula chloropus indicus Blyth. The Indian Moorhen.

One was taken on the pool mentioned above on February 4.

Burhinus oedicnemus mayri Koelz¹.

Stone-Curlews were constantly in evidence at night from their call, when they came to feed in the clearings. They apparently hunted beetles around the cattle-dung. During the day they were seldom seen. In January individuals or even small flocks could occasionally be found resting on the outcrop-rocks of certain brushy knolls and the natives said that they regularly congregated at such places in the winter. In February they had segregated into pairs and then were secretive. A female taken on March 12 was laying. They apparently nest in the scrub jungle.

Charadrius dubius curonicus Gmelin. The European Little Ringed Plover.

A few individuals were occasionally seen in the growing ricefields.

Wing measurements ♂ 109.5; 2 ♀ 113 mm.

Lobivanelus indicus indicus (Boddaert). The Indian Red-Wattled Lapwing.

Rather common, usually in pairs, in the clearing. Sometimes they were also found on the rock outcroppings frequented in winter by *Burhinus*.

Wing measurements 4 ♂ 218-229; 4 ♀ 212-232 mm.

¹ Walter Koelz, 'New Birds from Asia, Chiefly from India' *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82.

Lobipluvia malabarica (Boddaert). The Yellow-wattled Lapwing.

Found only on the pasture plain at Jagalbed where several pairs were breeding.

Tringa ochrophus Linnaeus. The Green Sandpiper.

Found not uncommonly along the streams and standing water.

Tringa glareola Linnaeus. The Wood-Sandpiper.

Found most often in the growing rice, and there not uncommon.

Tringa hypoleucos (Linnaeus). The Common Sandpiper.

Common along the streams. A specimen taken had albinistic primaries on both wings.

Scolopax rusticola indica Hodgson.

Borings were common along the soft banks of certain streams and absent on others. On February 10, 2 birds were collected along one of these favourable streams and thereafter no more came. The only sight records that do not concern these specimens were made on February 10 and 28, March 10, when single birds were seen at widely separated localities.

These specimens and others that I have seen from the Nilgiris and the Kangra District of Punjab, differ sufficiently in my opinion, to be recognized subspecifically and I think that Hodgson's name *Scolopax indicus* (J.A.S.B., vi, 1837, p. 490) of Nepal, should be used for them. The Indian birds are darker, especially above, and have more black in the markings. The feet average heavier.

Capella stenura (Bonaparte). The Pintail Snipe.

Rather common in the rice fields.

Wing measurements 5 ♀ 127-136 mm.

Phalacrocorax niger (Vieillot). The Little Cormorant.

Not rare along the larger streams.

Wing measurements 2 ♂ 202, 204 mm.

Anhinga melanogaster Pennant. The Indian Darter or Snake-bird.

Like the last. No specimens taken.

Pseudibis papillosus (Temminck). The Indian Black Ibis.

A single specimen was seen on March 10.

Dissoura episcopa episcopa (Boddaert). The White-necked Stork.

Not rare; singly or in small groups; shy.

Wing measurements ♂ 481; 2 ♀ 480, 482 mm.

Leptoptilos javanicus (Horsfield). The Smaller Adjutant.

Two individuals were feeding in a ricefield on February 20. No others were seen.

Ardea cinerea Linnaeus. The Common Grey Heron.

Occasional individuals were seen along the larger streams, but they were too shy to approach.

Egretta intermedia intermedia (Wagler). The Indian Smaller Egret.

A flock of about 30 stayed in a ricefield near Castle Rock. Elsewhere only stragglers were seen.

Wing measurements ♂ 293 mm.

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Egretta garzetta garzetta (Linnaeus). The Little Egret.

Rather rare and seen only singly.

Wing measurements 2 ♂ 271, 275 mm.

Bubulcus ibis coromandus (Boddaert). The Cattle Egret.

Not rare, attending the pasturing flocks on suitable plains.

Wing measurements ♂ 250; 3 ♀ 237-240 mm.

Ardeola grayii (Sykes). The Indian Pond-Heron.

Common, and found wherever there was water. Since puddles and pools were rare, the birds frequented running water more generally than they usually do.

Wing measurements 5 ♂ 209-224; ♀ 190.5 mm.

Butorides striatus abboti Oberholser.

Not rare, along the larger streams.

Wing measurements 4 ♂ 172-176; 4 ♀ 166-169 mm.

On the basis of these measurements, the form might be considered *javanicus* (wing 165-180 mm.) but I find on comparison with specimens from the Java region that in the latter males have light markings reduced and duller, and females have a smaller white wing-spot and whiter underparts.

Ixobrychus cinnamomeus (Gmelin). The Chestnut Bittern.

Rather rare. Two specimens taken, and four others seen.

"NEW BIRDS FROM ASIA, CHIEFLY FROM INDIA"¹.

Under the above title Mr. Walter Koelz has described 63 new races in the Proceedings of the Biological Society of Washington, Vol. 52, pp. 61-82 (5 June, 1939) of these new races 17 are described from Afghanistan and 44 from India so the paper should be of considerable interest to Ornithologists in India. Unfortunately a perusal of the paper leads to considerable disappointment as it is evident that Mr. Koelz has not had access to sufficient material to enable him to discriminate between good and bad races.

As these new forms have been described, named and published it is necessary to take notice of them. I have therefore been carefully through them and it may be of interest to record the results of my examination of the 44 new Indian races. These will be examined in detail but before doing this it may be well to make two preliminary observations.

The first is that of the 44 new races no less than 17 are given type localities at Londa, Jagalbed and Castle Rock, places which lie just inland from Goa. This area was already well known owing to the papers on the South Konkan by Vidal (Stray Feathers ix, pp. 1-96), on Belgaum by Butler (S. F. ix pp. 367-442) and North Kanara by Davidson (J.B.N.H.S., x, pp. 652-679), xii pp. 43-71 and good collections made in these areas by these gentlemen are in the British Museum. The triangle, roughly 15 miles on a side, formed by lines joining Londa, Supa and Castle Rock, which includes the type localities of the 17 forms is ornithologically intermediate in character marking the transition of the South Indian and the South-western humid mountain forms into the North Indian and drier Deccan forms.

The second point to make is that Mr. Koelz makes no attempt to define the distribution of his new forms. He fixes a type locality and sometimes mentions another locality or two where other specimens were obtained. Had he completed his work and attempted to define the distribution of his races he would have soon discovered how few of them could stand.

Now to comment on the new forms:—

P. 61. *Parus major stupae* (type locality Sanchi, Bhopal).

It is quite correct that birds from Peninsular India should be separated from *P. m. mahrattarum* (Ceylon). •

¹ We publish comments by Mr. H. Whistler on the new races of Indian birds described by Mr. W. Koelz, some of which are referred to in the paper printed above.—EDS.

Mr. Koelz has, however, overlooked the essential differences: *stupa* differs from *mahrattarum* in being brighter and paler above, the white edging to the tertiaries is much broader and the bill is not so large.

P. 63. *Macholophus xanthogenys xanthonotus* (Londa).

This is merely the intermediate between *M. x. aplonotus* and *M. x. travancorensis* and is not a recognisable race. These 2 forms intergrade along the western coast of India and birds from N. Kanara and Belgaum (between which Londa is situated) go best with *travancorensis*, whereas from Mahableshwar northwards the form is clearly *aplunotus*; *xanthonotus* can be relegated to the synonymy of *travancorensis*.

P. 63. *Sitta frontalis simplex* (Londa).

I have recently compared good series of this Nuthatch from various localities in Peninsular India with topotypes from Ceylon and can find no recognisable difference. *Simplex* is merely a synonym of *frontalis*.

P. 63. *Aegithina tiphia septentrionalis* (Bhadwar, Kangra).

This form is separable on the differences given.

P. 64. *Iole icterica intensior* (Kunjapani, Nilgiri Hills).

I have carefully examined this species for races on several occasions, comparing birds from Ceylon, Travancore, Nilgiris, Mysore, Kanara and Mahableshwar. There are no races and the differences alleged for this race are not constant.

P. 65. *Saxicola caprata rupchandi* (Londa).

This must become a synonym of *burmanica*, which is itself a synonym of the typical race. I have examined specimens from north, south and west of Londa and from as close to it as Belgaum and all are clearly the same. The differences alleged are merely individual.

P. 66. *Cercomela fusca ruinarum* (Sanchi, Bhopal State).

I have recently examined specimens from Jaithari, near Sanchi and could find no difference in size or colour from birds from the Punjab. This species has no races, nor would one expect them from its limited distribution.

P. 66. *Saxicoloides fulcata lucknowensis* (Lucknow).

I have not actually seen specimens of this bird from Lucknow, but they must be the same as those from Etawah, Futtehghar, Benares and Moghulserai, other similar localities in the United Provinces from which there are specimens in the British Museum. These are all *S. f. cambaiensis* and *lucknowensis* will become a synonym of that name. It is evident that Mr. Koelz has not allowed for the considerable variation induced by wear and bleaching in this form.

P. 67. *Saxicoloides fulcata stuartbakeri* (Bodhgaya, Bihar).

Two males from Rognathpur and Lohardugger (wings 72-73.5 mm.) and two females from Maunthum (wings 70-71 mm.) in the British Museum are also small compared with north-western birds (10 ♂ Punjab; with 73-81, 12 ♀, wing 71-76.5 mm.). As this is the north-easterly limit of the distribution of this species in India the recognition of this race may be useful though its limits will be very difficult to define.

P. 67. *Muscicapa strophilata euphonia* (Kulu).

This race is recognisable, west Himalayan birds being definitely paler than East Himalayan specimens. I noted the point some years ago but wanted to confirm it with more, fresh material.

P. 68. *Hyphothymis azurea similis* (Londa).

There is a good series of this flycatcher in the British Museum from the whole of its distribution in western Peninsular India, and it is clear that it

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cannot be divided into 2 races in that area. Mr. Koelz's name must therefore become a synonym of *H. a. sykesi* (Dukhun) even if he does not agree with my action (*J.B.N.H.S.*, xxxvi, p. 91) in holding that *sykesi* is a synonym of *styani* (Hainan).

P. 68. *Chelidorhynch hypoxantha noa* (Naggar, Kulu).

I have several times examined good series of this species for east and west Himalayan races, and though I agree it would be possible to select specimens to illustrate the differences cited by Mr. Koelz they are not sufficiently constant to warrant the recognition of two races.

P. 68. *Leucocirca albicollis canescens* (Bhadwar).

The remarks made under the last species apply again here.

P. 69. *Hemipus picatus insulæ* (Wavenden, Ceylon).

This is an excellent race in that the female has a black back like the male and not a brown back as in the typical South Indian form. Mr. Koelz's name is however antedated by *Hemipus picatus leggei* Whistler, Bull, B.O.C. vol. lix no. ccccxxii (15 May 1939) p. 101.

P. 69. *Tephrodornis pondiceriana warei* (Londa).

I have already discussed the position regarding the races of this somewhat variable species (*J.B.N.H.S.*, xxxviii, p. 309) and shewn that the typical form is itself a variable intermediate. No good purpose can be attained by subdividing the intermediate again and this name can only be a synonym of the typical form. Mr. Koelz would be puzzled to define a range for his new form.

P. 69. *Pericrocotus cinnamomeus sidhoutensis* (Sidhout, Madras Presidency).

The question of the name and races of this interesting and variable bird has already been dealt with at some length (*J.B.N.H.S.*, xxxvi, p. 343), and the original reference may be consulted as too long to repeat here. Specimens from Kodur and the Cumbum Valley (south and north of Sidhout) were obtained in the E. ghats Survey and they were referred under the above argument to the typical race *Pericrocotus peregrinus peregrinus* of which I propose to consider this name a synonym.

P. 70. *Chiblia hofmanni londæ* (Londa).

This is a recognisable form on its smaller size compared with Sikkim birds.

P. 70. *Orthotomus sutorius londæ* (Londa).

I have examined specimens from Ahmednagar, Matheran, Mahabaleshwar and Belgaum on the one side of Londa, and from various localities in Mysore on the other and could detect no difference between them. All appeared to me to agree with *guzerata* and with Sykes' Deccan types of *vennetti* and *lingoo* which would in any case antedate Mr. Koelz's name.

P. 71. *Orthotomus sutorius sindiana* (Hyderabad, Sind).

Ticehurst (*Ibis*, 1922, p. 551) compared fresh Sind specimens with topotypes and could find no difference, but as he pointed out the fact was not surprising as in Sind this species does not come under the influence of desert conditions.

P. 72. *Prinia sylvatica palniensis* (Kodaikanal, Palni Hills).

This is the first record of the Jungle Wren-Warbler from the Palni Hills, but Mr. Koelz in citing his paratypes from Kodaikanal and Ootacamund admits that the Palni and Nilgiri birds are the same. The new name is therefore merely a synonym for the typical race of which the type locality is the Seegore Pass, Nilgiris. Jerdon's words 'I have only seen this species hitherto in open forest jungle in the Seegore pass of the Nilgiris' (Madras Journal Lit. Sci.,

vol. xi, 1840, p. 4) are explicit and it is not open to Mr. Koelz to underline the word *hitherto* as he has done) and then say that 'it seems likely then that Jerdon's description refers rather to the race in the surrounding lowland than to the Nilgiri race and the former may be considered typical *sylyatica*'. I have seen no evidence in any case to suggest that this species varies according to altitude and the alleged differences are not impressive.

P. 73. *Prinia sylvatica mahendrar* (Mahendra Giri, Orissa).

I have not seen enough material of this warbler from N.-E. India to comment on this name with confidence but Mr. Koelz has not explained how this new race is to be distinguished from *P. s. gangetica* to which one would rather expect it to belong and to which the description might easily apply.

P. 72. *Oriolus oriolus baltistanicus* (Sagoni, Baltistan).

Specimens from Balbistan in my own collection are not separable from *O. o. kundoo*. One would not expect them to differ as Turkistan birds are also *kundoo*. The differences alleged for the new race are merely individual.

P. 73. *Lonchura striata estriata* (Jagalbad).

There is a good series of this Munia in the British Museum including one of Fairbank's birds from the Goa frontier, and others from the north and South of the type locality of the new subspecies. These show that South Indian birds as a whole, including the area under discussion, cannot be separated from the typical race of Ceylon.

P. 74. *Erythrina rubicilla ebilis* (Puga, Rupshu).

Specimens from Puga were examined by Hellmays (*F.M.N.H. Publ.* 263, 1929 p. 47) and found to be perfectly typical specimens of *severtzovi*. Other specimens collected in Ladakh by Henderson, Osmaston, Meinertzhagen and Landow and a series collected by myself in Spiti and Lahul have all been critically examined by various workers and found to be identical with Turkestan birds so it is evident that this new race is not recognisable.

P. 75. *Anthus hodgsoni burzil* (Burzil Pass).

I would hazard a guess that this will prove to be a synonym of *Anthus trivialis haringtoni* which possesses the character of the new race, a heavy bill. At any rate Osmaston and I obtained *haringtoni* on the Burzil Pass at 12,000 ft. on 26 July 1928 and found it common in that area, whereas *Anthus hodgsoni* has not been reliably reported west of Chamba and the Duale Shar, nor in Lahul from where Koelz quotes his paratypes.

P. 75. *Motacilla maderaspatensis kangra* (Bhadwar, Kangra).

My own collection contains a series of this wagtail from Kangra and other Punjab localities, but neither Dr. Ticehurst nor I have been able to separate them from the typical form.

P. 76. *Mirafra cantillans bangsi* (Hospet, Madras Presidency).

Neither the material in the British Museum nor my own collection nor the few specimens I have seen from other sources allow me to comment on this form.

P. 76. *Galerida malabarica propinqua* (Londa).

There is a large series of this lark in the British Museum, including specimens from Belgaum, close to Londa, and from both north and south of Londa and this series shows that no race can be separated for the Londa area. The breeding season of this lark is not a clearly defined one and individuals may be in a different state of wear at the same time, such wear affecting their appearance greatly.

P. 76. *Zosterops palpebrosa palniensis* (Kodaikanal, Palni Hills).

I have not actually examined specimens of the White-eye from the Palnis but these hills are only a spur of the Travancore ranges and all birds from

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the latter are identical with *nilgiriensis*. As it is incredible that one spur should contain a peculiar race of this active and generally distributed little bird this name is doubtless a synonym of *nilgiriensis*.

P. 77. *Arachnothera longirostra vantlynei* (Jagalbad).

The type locality of *Certhia longirostra* Latham is 'Bengal' later restricted by Stuart Baker (*J.B.N.H.S.*, xxviii p. 124) to Sylhet; the Malay specimens cited by Mr. Koelz in his diagnosis are therefore irrelevant, and his separation of a Peninsular Indian race is based on comparison with one specimen from N. India. A comparison of a proper series from N. India and the Peninsula would have shown him that there is no difference either of colour or size.

P. 77. *Piprisoma agille saturatior* (Londa).

There are 3 specimens from Belgaum, close to Londa, in the British Museum and these are quite inseparable from the birds of the rest of the Peninsula. The amount of streaking is a question of individual variation.

P. 77. *Pitta brachyura pulchra* (Bhadwar, Kangra).

In separating this supposed Himalayan race from Ceylon topotypes, Mr. Koelz has overlooked the fact that this *Pitta* is a summer visitor to the sub-Himalayan area and a winter visitor to Ceylon. My own specimens from Kangra and fresh birds examined in the Ceylon survey are quite indistinguishable.

P. 78. *Brachypternus benghalensis woodi* (Jagalbad).

This is of course merely the intermediate between *puncticollis* and *tehminae*. The existing races of *Brachypternus benghalensis* are already sufficiently difficult to separate and there is no value in giving names to their intermediates. I have already pointed out (*J.B.N.H.S.*, xxxvii p. 292) that the red fringing to the feathers found in a greater or less degree on the golden upper parts of many specimens has no racial significance beyond the fact that it apparently never occurs in the desert race *dilutus*.

P. 78. *Chrysocolaptes guttacristatus socialis* (Jagalbad).

In the British Museum material, I could see no difference between birds from South India and birds from Malaya. On the Rothschild material Mr. Koelz claims a difference in colour. An independent examination of fresh material seems necessary.

P. 78. *Xantholæma hæmacephala confusa* (Londa).

The differences alleged appear to be due to wear. I have examined a good series of this species from the whole of the west of Peninsular India and, allowing for differences due to wear and individual variation, could find no difference between them and other Indian birds.

P. 79. *Tockus birostris pergriseus* (Lahore).

This race is based on a single specimen on characters which my own Punjab series shows to be merely a question of individual variation.

P. 79. *Harpactes fasciatus legerli* (forests at the fort of Mahendra Giri, Orissa).

This race is based on a single specimen so it is difficult to understand how Mr. Koelz can say 'the wing may average longer.' I have seen no specimens from this area and can give no opinion therefore on the validity of the new race.

P. 80. *Caprimulgus asiaticus gurgaoni* (Huttin, Gurgaon).

There are other Gurgaon specimens in the British Museum and this race may be recognisable. Yet it would be well to bear in mind what I wrote in the Eastern Ghats Survey (*J.B.N.H.S.*, xxxviii, p. 38). 'I have not been able to understand the division of this Nightjar into races satisfactorily. There are at any rate three colour phases, pale sandy, brown and grey and there appear to be some correlation of these phases with locality, the pale sandy-birds coming from the north-west, the grey birds from the Deccan and the

brown birds from other localities. The phases, however, so grade into each other and there seem to be so many exceptions to their connection with special localities that I hesitate to consider these colour phases as definitely subspecific.

P. 80. *Tyto alba crypta* (Londa).

I have examined a large number of Barn Owls in the British Museum and elsewhere from the Punjab to Travancore (including specimens from Bombay and from Belgaum close to Londa) and all are evidently one, somewhat variable form *T. alba stertens* of which this new name appears to be a synonym.

P. 80. *Otus bakkamœna stewarti* (Bainnath, Kangra).

Mr. Koelz has here evidently been deceived by individual variation. I have a small series of these Scops owls from Kangra and they are variable both in depth of colouration and in the amount of darker marking. The name will be a synonym of *plumipes*.

P. 80. *Ægolius funerea juniperi* (Kyelang, Lahul).

This species is a most interesting addition to the Indian Empire list and I have no material on which to discuss the validity of the new race.

P. 81. *Streptopelia orientalis sylvicola* (Castle Rock).

It is difficult to discuss the colouration of these doves from written descriptions, but Mr. Koelz has not stated how this series, evidently breeding in March at Castle Rock, differs from the breeding bird of the Peninsula whose exact range is uncertain, but which clearly breeds both in the Sambalpoore area and in Mysore. If the same, as would seem to be the case, it already has a name *Turtur erythrocephalus* Bonaparte, *Consp. Gen. av. vol. ii. p. 60* after April 15, 1855 (type locality *errore* Cape of Good Hope) of which the type is in the British Museum.

P. 82. *Burhinus oedonemus mayri* (Londa).

I have not seen any specimen of a Thick-knee from this area so cannot comment positively on this new race. All birds examined, however, from Cutch, Gujrat, Khandesh, Central and South India and Ceylon belong to the one from *B. æ. indicus* so one would hardly have expected a local race of limited distribution in this area.

P. 82. *Lobivanelius indicus lankæ* (Galgamuwa, Ceylon).

There seems to be very little point in separating a Ceylon race of this species. The position is as follows. This species grades in size and colour from Ceylon to N.-W. India. If birds from these two extremes are compared they are fairly distinct, Ceylon birds being deeper in colour above with the gloss, especially the purple gloss, more pronounced. They are also slightly smaller, but not as small as Mr. Koelz's Series (3 ♂ Wing 201-209 mm.) suggests. 4 males in the British Museum have wings of 213-223 mm. and 4 males obtained by the Ceylon Survey have wings of 211-220 mm. Five males from the Punjab in my collection have wings of 211-234 mm. The type-locality Goa lies in the middle of this intergrading but closer to Ceylon than to the north-west. There is so little difference between the two extremes and there is so much individual variation that I wondered at one time whether it was even worth recognising the two races *indicus* and *aigneri*. To divide the intergradation into three races seems quite valueless.

H. WHISTLER.

CALDEC HOUSE,
BATTLE SUSSEX, ENGLAND,
7-10-1941

THE EARLY STAGES OF INDIAN LEPIDOPTERA.

BY

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PART IX.

(Continued from Vol. xlii, No. 4 (1941), p. 756.)

RHOPALOCERA.

SATYRIDAE.

Melunitis leda L., *ismene* Cr.

Moore, *Lep. Ceyl.*, i, 14, pl. 10, fig. 2b. 1880-81.

Bingham, *Fauna Brit. Ind.*, Butterflies, i, 159. 1905.

Ovum spherical, the base flattened. Pale silvery green, without sculpturing. Laid in twos or threes on the underside of a blade of grass. Laid 25-ix-41. Hatched 29-ix-41.

1st instar—Head large, dark brown, the mouth parts paler and with a pale knob on either side of the vertex. Body white when first hatched, turning green after feeding. Anal plate produced into two short processes. Both head and body clothed sparsely with comparatively long black hair. Moulded 1-x-41.

2nd instar—Head black, hairy, square, with comparatively long black horns in place of the pale knobs of the previous instar. Body blue-green, at first unmarked but later a double dotted white subdorsal line develops. Anal processes comparatively longer. The body clothed with short colourless hairs, the anal processes with black. Moulded 3-x-41.

3rd instar—Similar. The hairs on the anal processes colourless. A second form has the head green, the horns black, and a black stripe edged behind with white from the base of the horns to the side of the jaws. Moulded 5-x-41.

4th instar—Head square, black and hairy, an elongate white spot laterally just outside the jaws, horns black. Some examples have three green spots frontally, which may be joined together into a roughly triangular mark. A second form has the head green, the horns black and with a black stripe edged behind with white from the base of the horns to outside the jaws. A third form is similar but the black stripe is broader and there is a black stripe across the vertex connecting the base of the horns. Body rather yellowish green than previously, shagreened. A dark blue-green dorsal stripe edged with a line of minute yellow dots, a double subdorsal yellow dotted line and a pale subspiracular stripe. Moulded 8-x-41.

5th instar—Head similar to previous instar but the horns dark purplish with black hairs. The black stripe of the second form often with a tooth onto the face about two-thirds down its length, in which case the stripe is broader. Mouth parts black edged above.

with white. Body similar to the previous instar but of a lovely bright grass green, rather similar to the colour of young paddy. Pupated 15-x-41.

Pupa suspended by the cremaster from a pad of white silk. Shape head truncate, thorax slightly humped, wing cases rounded. Colour jade green, rather translucent, a diffused darker abdominal dorsal stripe and an indistinct yellowish spiracular line. Veins of the wing cases dark. A male emerged 21-x-41.

Food-plant—Grasses.

The larvae keep together up to the 3rd instar, after which they scatter.

Described from larvae bred from ova deposited by a Calcutta caught female.

Moore, in *Lep. Ceyl.*, gives the following description:— 'Larva elongated, thickened in middle, pubescent, head large, surmounted by two short pubescent red processes, last segment also with two processes; pale green with longitudinal rows of whitish dots; dorsal and lateral line darker green; head bluish, striped with white and black. Pupa green, cylindrical, head and thorax obliquely flattened. Feeds on *Gramineae*.' The figure is untrue to life in both shape and colour. Bingham, without giving references, writes as follows:— 'Larva long, slender, somewhat fusiform, rough; terminal segment armed with two divergent setose fleshy processes (Moore). Colour grass-green with a yellow lateral line and many rows of small white spots, with the horn and continuing cheek-stripe red, and three black spots on the face, but sometimes the head and horns are dark brown with three white spots on the face (Aitken). Pupa, thick, smooth, abdomen dorsally convex; head case terminating in an obtuse point; colour pale watery green without markings (Moore).'

GRYPOCERA.

HETEROPTERINAE.

Matapa aria Moore.

Young larva—Head black, rather large and heart-shaped. Body bright crimson, tinged with green. A transverse black line on the posterior edge of the 1st somite.

Full grown larva—Head heart-shaped, amber yellow with the mandibles black and the eyes blackish. Body with the 1st somite only slightly constricted and the anal flap broad but not much flattened. Colour pale silvery green at the beginning of the instar, the green gradually fading and the larva becoming covered with a dense white powder as it ages, the secondary segmental folds tinged with yellow. A transverse blackish line on the posterior portion of the 1st somite. Spiracles black, that on the 11th somite very much larger than the others. A pair of dark orange kidney-shaped organs under the skin of the dorsum on the 9th somite. A few short whitish hairs, most abundant on the edge of the anal flap. Legs very pale fawn. Prolegs and venter whitish green. Lives in a spirally twisted leaf.

The transition from the coloration of the young larva to that of the adult is gradual, the head becoming paler in colour with each ecdysis and the crimson gradually fading.

Pupa in a cell made from a spirally twisted leaf and lined with white silk. Moth-like in shape, the divisions between head, thorax and abdomen fairly well marked. Somites rather deeply cut. Apex of abdomen flattened and triangular. Colour very pale whitish green, covered sparingly with a white waxy powder. The pupal skin is very thin and collapses completely after emergence. The pupa wriggles very violently in its cell when touched and makes a distinct buzzing sound.

Food-plant—Bamboos.

Described from a full fed larva found in Calcutta 14-ix-41, pupated 20-x-41, and a female emerged 28-ix-41.

PAMPHILINAE.

Astycus pythias Mab., *bambusae* Moore.

Head pale fawn with a dark brown central stripe from vertex to apex of the clypeus, where it divides and follows the clypeus' outer edge. Usual shape of the family with the 1st somite constricted and the anal flap broad and flat. Colour yellowish green, but the skin is transparent and the colour appears a dark green due to the contents of the intestines. The skin is so transparent that the larger trachea, silk glands, etc. are all clearly visible. Traces of a pale subspiracular line. Spiracles pale yellow. Legs, prolegs and venter paler green. A few short whitish hairs, particularly noticeable on each side of the anal flap. When completely full fed two small bright yellow kidney-shaped organs appear under the skin of the dorsum of the 9th somite. Lives in a cell formed from a turned-over leaf.

Pupa in a cell formed from a turned-over leaf; a bite is made more or less at right angles to the edge of the leaf and the flap formed is turned over and secured with silk. The cell is lined with white silk and covered with a white waxy powder, which also covers the pupa. Pupa moth-like in shape, pale yellowish chestnut in colour, the head, thorax and wing cases tinged with purplish. Cremaster broad and flat, a short stout spine on each side, the central portion with hooked, almost colourless, hairs.

Food-plant—Bamboos.

Described from a full fed larva found in Calcutta 8-ix-41, pupated 11-ix-41, and a male emerged 20-ix-41.

Baoris zelleri Led., *cinnara* Wall.

Moore, *Lep. Ceyl.*, i, 167, pl. 70, fig. 3b. 1880-81.

Head heart-shaped, pale olive green, a broad white stripe on either side edged behind by a narrower dark brown stripe. Ground colour of body bluish green, the secondary segmental folds rather more yellow. A darker dorsal stripe edged on each side with whitish and a whitish subdorsal line. Spiracles white. Legs, prolegs and venter bluish green. Shape with the 1st somite constricted, the anal flap broad and flat and fringed with a few short

whitish hairs. In the very early instars the head is black, developing a broad white stripe on the side in the penultimate instar. In some examples the black and white striped head appears in the final instar and the usual colour is not attained.

Lives in a folded blade of grass and suffers very badly from the attacks of ichneumons, out of six larvae found in the penultimate instar only one reached the final and that failed to pupate.

Pupa grass green, rather translucent. A double white dorsal and a white subdorsal line on the abdominal somites. Head produced into a stout spike. In a slightly folded blade of grass, secured by a girdle of white silk and the cremaster attached to the silk lining of the grass.

Food-plant—Grasses.

Described from a full fed larva found in Calcutta 13-x-41, pupated 15-x-41, and a male emerged 22-x-41.

Moore gives the following description under the name *Parnara cingala*:—Larva very pale olivaceous-blue, with a darker dorsal and a paler lateral longitudinal line; head yellowish. Feeds on Gramineae. Pupa pale olive-green.

HETEROCERA.

SATURNIIDAE.

Dictyoploca simla Westw.

Head green, with short bristly green hairs. Body pale silvery green, with a raised subspiracular yellow line which is flecked with orange below each spiracle. Dorsal area clothed with medium length erect blue-green hairs, lateral area and venter with short bristly yellow-green hair. A subdorsal and lateral series of very small green tubercles tufted with short urticating bristles. Spiracles blue and broadly ringed with blue. Legs orange pink. Prolegs green, the feet pinkish with a basal black ring. Anal plate and claspers green minutely flecked with black.

Cocoon net-like, of golden brown silk, the threads and mesh coarse. Pupa pale pinkish brown, the wing cases slightly green tinged, the intersegmental areas darker brown. Cuticle very hard and minutely wrinkled.

Food-plant—*Lagerstroemia indica* Linn. and a number of unidentified shrubs.

Described from a full fed larva found in Shillong 8-v-41, pupated 16-v-41, and a male emerged in Calcutta 20-xi-41. In Shillong, probably, emergence would not have taken place until March or April.

SPHINGIDAE.

Herse convolvuli L., *convolvuli*.

Moore, *Lep. Ceyl.*, ii, 5, pl. 75, figs. 1, 1 b-e. 1882-83.

Hamps., *Fauna Brit. Ind.*, Moths, i, 103. 1892.

Seitz Seitz, *Indo-Austr. Bombyces*, x, 527.

Bell & Scott, *Fauna Brit. Ind.*, Moths, v, 63, pl. ix, figs. 1-7.

1937.

Ovum disproportionately small, of the usual Sphingid shape. Colour bright jade green. Unsculptured. Laid 4-x-41. Hatched 7-x-41.

1st instar—Head round, yellow green. Body yellow green when hatched becoming darker and bluer after feeding, rather long and thin. Horn straight and black, the tip bifid. Moulded 10-x-41.

2nd instar—Similar. Under a lens the skin of the dorsum is shagreened and there is a bluish tinged dorsal stripe. Moulded 12-x-41. A wild caught larva was similar.

3rd instar—Similar. A lateral series of black spots, usually obsolete on 2nd and 3rd somites. Legs purple. Prolegs green, in a few larvae they were blackish. Horn upright, black, in a few larvae with a whitish band about one-third down from the apex, in these the underside of the horn is also whitish towards the base. Later in the instar a series of darker oblique stripes edged behind with whitish, and with a black speck in the centre of each, appears, these stripes extending from the dorsum to the lateral area. Moulded 15-x-41. The wild caught larva mentioned above did not develop the lateral oblique stripes towards the end of the instar.

4th instar—Head green with white granules and with a blackish lateral stripe. Body green with white granules. An interrupted purplish black subdorsal stripe composed of slightly oblique streaks. A lateral series of oblique pale stripes edged above with purplish black. Spiracles orange ringed with black. Legs purplish, the base black. Horn with the base orange, the rest black, in some examples with a whitish band about a third from the apex. Prolegs black. The amount of blackish purple marking varies considerably, some larvae having the subdorsal stripe continuous and broad, in others it being broken and narrow. The lateral stripes also may extend the whole length of the pale stripes or be reduced to a short streak in the middle. Venter with a blackish median line. Moulded 17-x-41. The wild caught larva mentioned above had the head green with white granules and a white lateral stripe. The body green with white granules, a series of oblique slightly darker green stripes meeting on the dorsum and edged below on the lateral area with whitish. Spiracles orange ringed with black. Legs purplish. Prolegs green. Horn whitish green with white granules, the extreme tip black and a black stripe along the upper surface from base to about a third from the apex.

Final instar—Head buff with an inverted black Y-shaped mark, a broad black subdorsal stripe and a second broader one behind it but not reaching the vertex of the head nor the base of the antenna. Ground colour of body deep chocolate brown speckled with paler, in some examples the ground colour is tinged with tawny. A pale buff subdorsal stripe on the thoracic somites, usually continued on the abdominal by a spot on the anterior portion of each somite, this spot sometimes becoming a streak. Some examples with traces of a buff dorsal stripe with a median line of the ground colour. A lateral series of oblique dark stripes, obscurely edged behind with paler, these stripes almost invisible in the darkest forms. A broad whitish subspiracular stripe crossed by an occasional dark brown

line. Spiracles black and set in circular black patches. Legs black. Prolegs and venter smoky brown. Anal claspers almost black externally. Horn black, downcurved. Anal flap outlined by an orange-buff stripe. Pupated 23-x-41. The wild caught larva was similar to the above in the last instar.

Pupa subterranean in an earthen cell. Colour chestnut brown, the thorax and wing cases paler. A dorsal stripe and the inter-segmental areas of the abdomen darker. Proboscis sheath free, in a rather flattened curve to about the end of the first leg sheath and then back again along the body, the end slightly bulbous. Spiracles and cremaster almost black. A female emerged 3-ri-41.

Food-plant—*Ipomaea palmata* Forsk. and *I. aquatica* Forsk. Bell and Scott give the following list:—*Phaseolus* spp., *Dolichos Lablab* Linn., *Arachis hypogaea* Linn., *Helianthus* spp., *Ipomaea* spp. and *Convolvulus* spp.

Described from larvae bred from ova obtained from a Calcutta caught female.

Moore's descriptions are somewhat vague and his figures anything but lifelike, the pupa in particular being incorrect both in shape and colour. Hampson ignores the existence of the brown form completely and mentions that 'the European form has a black spot above each lateral stripe, the absence of which is the only character relied on for separating *orientalis*'. The female parent of my brood was of *f. orientalis* and most of the imagines bred belonged to this form.

NOCTUIDAE.

Earias cupreoviridis Wlk. (*chromataria* Wlk.)

Larva mottled dark and pale brown, rather swollen anteriorly and armed with rows of short fleshy spines. It unfortunately pupated before it was possible to describe it in detail.

Cocoon canoe-shaped, of thick, dark brown, papery silk. As is usual in the family, the imago escapes through a slit in the front of the cocoon.

Described from a full fed larva found in Calcutta, spun 3-x-41, and a male emerged 12-x-41.

Mocis (Remigia) frugalis F.

Moore, *Lep. Ceyl.*, iii, 190, pl. 172, fig. 4a. 1884-87.

Hamps., *Fauna Brit. Ind.*, Moths, ii, 527. 1894.

Hamps., *Cat Lep. Phal.*, xiii, 89. 1913.

Head dark olive brown, the clypeus filled in with whitish and with a white stripe from apex to vertex with a fine central brown line. The brown part of the head with fine white lines, one rather broader one arising from the external edge of the subdorsal body stripe. Ground colour of body yellow, in some examples almost orange, in others tinged with green. A double orange brown dorsal line. A subdorsal stripe composed of three olive brown lines. An olive brown lateral line with two orange brown lines between it and the subdorsal stripe. An orange brown subspiracular line. The lowest line of the subdorsal stripe is sometimes much darker on the anterior two-thirds of the 7th somite. The intersegmental

area between the 4th-5th and 5th-6th somites velvety black but only visible when the body is bent. 11th and 12th somites with a subdorsal black dot. Venter similar in ground colour but duller, a dark median stripe and three olive brown lines close together laterally. Legs pale brown. Prolegs pale olive brown, the first two pairs obsolete. Spiracles blackish.

The larvae vary very considerably in depth and brightness of colour. One example had the subdorsal stripe very dark, the lines composing it and also the lateral line blackish brown. Another had a white line on either side of the double orange brown dorsal line.

Pupa in a small cocoon of thin white silk covered with blades of grass. Pupa purplish brown and covered with a dense coating of white bloom. Apex of abdomen slightly conical and wrinkled, surrounded dorsally by eight blunt teeth and with six hooked spines at the extreme end.

Food-plant—Grasses.

Described from a full fed larva found in Calcutta 30-ix-41, spun 2-x-41, and a female emerged 11-x-41.

Moore's description is 'Larva semi-looped; with twelve legs; pale yellowish-ochreous, with slender longitudinal darker ochreous lines, an intervening sublateral row of dark olivaceous spots, and two subdorsal lines; fifth and sixth segment posteriorly edged with a dorsal black streak. Pupa ochreous-red. Feeds on *Zinziberaceae*.' Hampson's description in the *Fauna* is based on this but in the *Catalogue* he quotes the following description by Semper (*Reise Phil. Schmett.*, ii, p. 564, plate T, fig. 2):—'Ochreous with numerous fine waved red-brown lines, the subdorsal, lateral and sublateral stripes with black-brown lines; maculate black dorsal bands between 5th and 6th and 7th and 8th somites; a yellow stripe below the stigmata and ventral stripe; first two pairs of claspers absent. Food-plant, *Zinziberaceae*.'

Chalciope hyppasia Cr.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlii, 289. 1941.

The larva is extremely variable. In addition to the form previously described, a brood bred from ova in November 1941 contained the following.

One form very similar to that originally described but with the subdorsal and lateral areas irrorated with blackish. Another form had the 4th to 6th somites so densely suffused with blackish that the usual markings were obliterated, the subdorsal stripe being indicated by a series of white specks. The ground colour of this form may be yellowish, greyish or tawny, the lateral and subdorsal areas suffused to a greater or lesser extent with blackish. The head in the dark forms rather darker than in the form originally described.

GEOMETRIDAE.

Hyperythra lutea Cr.

Ovum barrel-shaped, dark slate grey and with about fifteen prominent longitudinal ribs, which do not extend to the ends of the ovum.

Newly hatched larva very long and slender. Bright chestnut brown in colour.

The larvae were offered Peepul, *Bauhinia* sp., *Lagerstroemia indica* Linn., *Rhynchosia minima* DC., *Polyalthia longifolia* Wall., *Ipomaea palmata* Forsk. and a cultivated *Euphorbia*, but refused to feed.

Ova laid by a Calcutta caught female 24-x-41, and hatched 28-x-41.

PYRALIDAE.

Crocidophora ptyophora Hamps.

Head chestnut brown. 1st, 2nd and anal somite clear yellow. 3rd to 12th somites creamy yellow, a dorsal line and the inter-segmental areas with the skin transparent and the dark green colour of the contents of the intestines shewing through. Legs pale chestnut. Prolegs creamy yellow. Venter coloured as dorsum. A few pale hairs. Before pupation the green colour disappears and the larva is a creamy yellow with the formerly green parts a pale clear amber.

Lives in a cigar-shaped roll of bamboo leaves, rolled the one over the other and secured by a few coarse strands of white silk.

Pupa in a slight cocoon of white silk and frass formed at the lower end of the larval case, the head pointing upwards. Colour bright chestnut, the ventral surface and wing cases considerably paler. The first four abdominal somites with a raised dark blister-like ridge dorsally.

Food-plant—Bamboos.

Described from a full fed larva found in Calcutta 8-ix-41, spun 11-ix-41, and a female emerged 19-ix-41.

Glyphodes bivitalis Guen.

Moore, *Lep. Ceyl.*, iii, 322, pl. 180, fig. 2a. 1884-87.
Hamps., *Fauna Brit. Ind.*, Moths, iv, 355. 1896.

Head honey colour. Body yellow green with the contents of the intestine shewing as a dark green central chord. 1st somite with a black dorsal plate. 2nd and 3rd somites with a black sub-dorsal spot with a conjoined white speck above. 11th somite with a transverse series of four black specks. Legs and prolegs almost colourless. The skin, except for the spots, is unpigmented the yellow green colour being due to the blood and fat. Before pupation the ground colour becomes a clear pinkish yellow. Lives in a folded leaf.

Pupa in a web of white silk in a folded leaf. Colour yellowish brown, the dorsum, particularly the intersegmental areas, rather darker. Leg sheaths, etc. very long and reaching almost to the end of the abdomen. Proboscis sheath projecting slightly frontally.

Food-plant—Peepul.

Described from a full fed larva found in Calcutta 3-xi-41, pupated 8-xi-41, and a male emerged 16-xi-41.

Moore's description is 'Larva rather stout, attenuated at the ends; olive brown, palest beneath; head reddish, and with a black lateral streak; a dorsal, subdorsal and lateral row of white dots, the latter with a few fine short radiating white hairs; some black dots on anterior and posterior segments. Pupa pale olivaceous-red; with an acute anal point and lengthened pedal sheath. Feeds on *Ficus oppositifolia*.' His figure shews a larva with a reddish brown dorsal and yellowish ventral area, the two divided by a grey-blue lateral stripe. Hampson's description is based on that of Moore.

(To be continued).

ON THE BANKS OF THE NARBADA.

BY

LIEUT.-COL. R. W. BURTON, I.A. (Retd.)

PART II.

*(With four black and white plates).**(Continued from Vol. xlii, No. 4 (1941), page 765).*

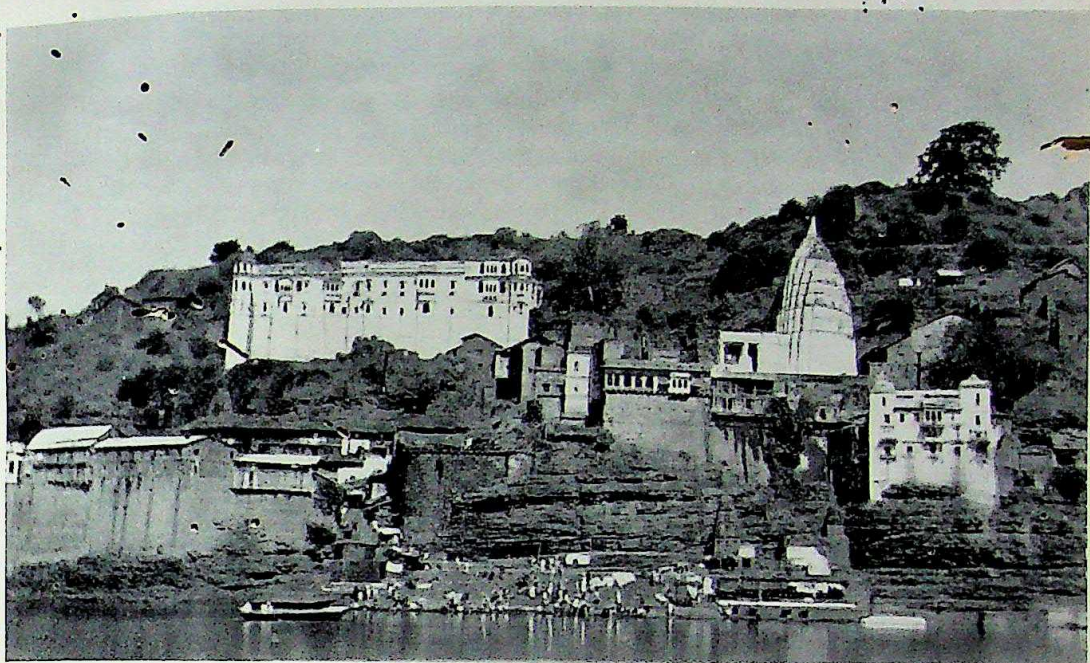
Now that there are some forty thousand miles of working railways in India it is difficult to realize those days prior to 1851 when the first section of the G. I. P. Railway was commenced from Bombay. Then the Narbada river was accessible only after weeks of travel, much of it through wild and difficult country.

The portion of the river where we are is about forty miles upstream from Dhariaghat, and some fifteen miles north of the line which runs more or less parallel to the river between Khandwa and Hoshangabad. There is no made road, so the car has a rough passage over tracks seldom traversed, even by bullock carts.

It is on the 25th December we reach the river to pitch camp in the open, in the vicinity of shady trees beneath which the tents will be placed when the weather gets warmer. Some young buffaloes are procured at an average price of eight rupees, and two goats at about the same rate. There are few villages, so beating after a 'kill' is not feasible and slaying of carnivora has to be from hide or machan. After a careful survey up and down stream a large tamarind tree by the side of a path some fifty yards from the river bank a mile and a half east of camp is fixed upon for a full length machan, the deciding factor for the exact location of the buffalo being the possibility of noiselessly stalking the place from the shelter of a sandbank and some bushes at earliest dawn, when the tiger should be on the 'kill'.

Less than a mile down stream a shady tree overhanging a steep path to the water is chosen for a chair; the place for the poor buffalo to await his blood-thirsty slaughterer being beside a driftwood tree trunk already half imbedded in the sand, a protruding branch, suitably trimmed, affording an excellent hold for the unbreakable wire rope with which the animal is to be tethered. Tracks have shown that tigers are in the habit of crossing the river, from island to island from the thick forests of the Indore side; to wander about the river bed and along the higher banks, on the look-out for game and domestic animals.

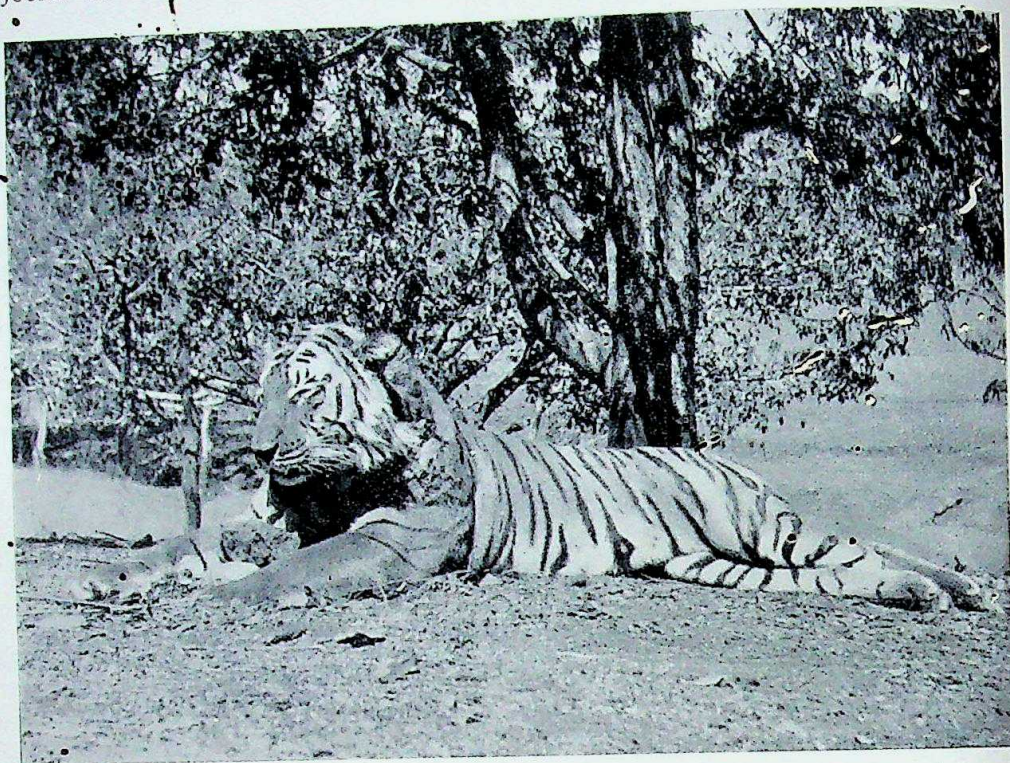
There is much acquired experience in all our arrangements. The machans must be well screened all round, also from above and below, this having to be done before any bait is tethered. Nothing is left to chance. There is a rest for the rifle and a small peephole, separate from the aperture from which the shot is taken by leaning forward, so that the kill can be observed without movement on the part of the watcher. Some nails are fixed into the tree trunk and boughs on which to hang water-bottle and other sundries. Each



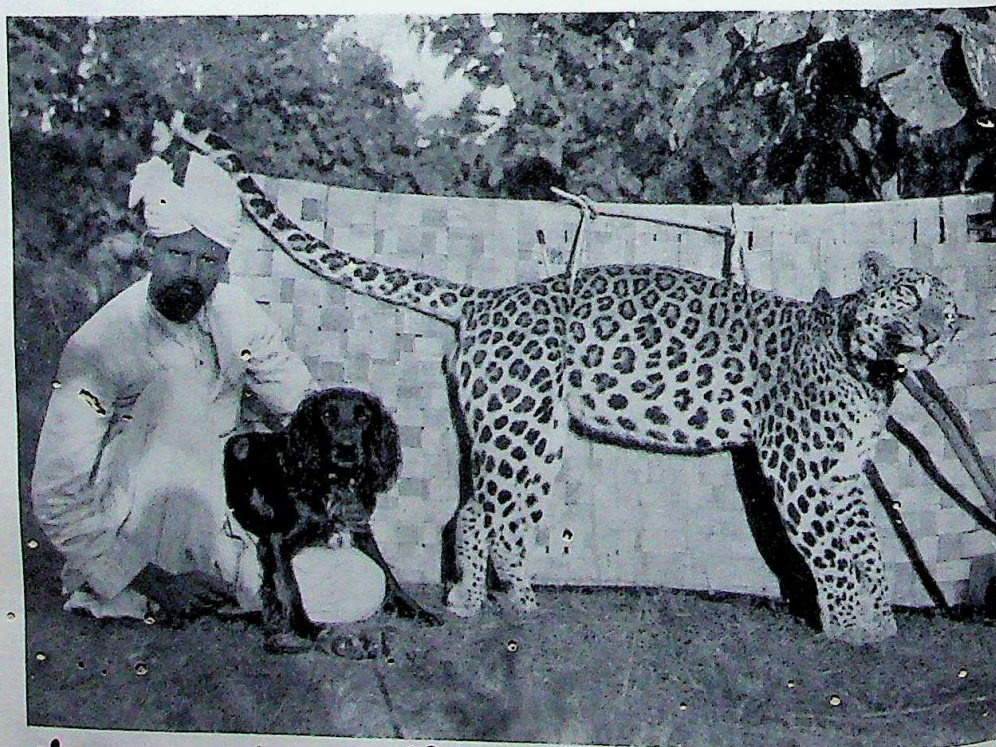
The Temple of Omkar on the Island of Mandhata.



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar
A Narbada crossing, the Folk Ferry.



A Narbada Tiger.



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar
Zilla Ben's fifth Panther.

day green branches are intertwined within the screen so that soon the machan viewed from the outside appears to be a mere bundle of dry leaves. To the chair a comfortable foot-rail is essential, and a small pillow has to be tied where the head will comfortably rest; for the vigil may be long or it may be short: we have to await the pleasure of our guest to his dinner, and at this season of the year we should be in position by three o'clock in the afternoon.

When all is ready at both the selected places men are engaged—two for each buffalo as they won't go alone—to tie up the baits each evening and visit them in the morning about an hour after sunrise. The animals require one's personal attention as to plenty of dry grass for night bedding, and proper feeding and watering during the day. Grass hereabouts is difficult to get, so a cartload is obtained from a distant village. We have two spare animals in order to give each 'bait' an alternate 'night in bed', and a couple of goats.

With mind at rest regarding all arrangements there are interesting walks abroad to learn one's surroundings. From the camp we see a ferry plying backwards and forwards across the river. The large flat-bottomed barge is run by a contractor who secures the necessary labour by subsidizing the villages on either bank, the people arranging among themselves a 'roster of duty'. The ferry fees are moderate enough. Two annas for a loaded cart and an extra anna if the bullocks are carried. An anna being a consideration most of them have to wade and swim, so there is much shouting and throwing of stones to force the animals across. Fare for a human passenger is one pie—rather more than a farthing!

It was by means of a number of barges of this kind collected from up and down the river that a passage was effected in 1817 by British Forces at the Hindia Ghat, which is twelve miles upstream. The army marched north into Rajputana, to fight the campaign against Holkar and the Pindaris which culminated in the battle of Mehidpur (21 Dec. 1817), the final defeat of the Mahratta confederacy, and the suppression of the Pindari marauders.

The village from near which the ferry plies is a small one of ten or twelve houses; the inhabitants Rajputs and Dhimars, with one Korku family providing the Headman appointed by Government. He is also the local shikari, but not of much use, being old and having fever every other day. This we treat him for and learn that there are two tigers on this side and others in the Indore forests along the further bank. A blue-bull being seen in the jungle the Korku is asked his taste in meat and replies that he could not stomach such flesh as that! and when an antelope is brought into camp and the tape run over its horns by a Christian and therefore 'unclean' hand he, in common with the low caste Dhimars, would have no truck with the meat. Such is the Hinduis-ing influence of residence along the banks of this sacred river; for in the Satpura Hills not far distant, the principal habitat of this jungle tribe, the Korkus eat tiger, panther, bear, and anything else that may be shot, even if the Sahib has had the principal hand in the skinning. It is the same in all the riparian villages of the valley in which some of these aboriginal Korku people have even taken to adding the Rajput affix 'singh' to their own lowly

patronimics, and 'Kuer' to that of their women. The cult of social climbing is common to all mankind.

The camp larder is empty and we have to find the where-withal to fill it, so the mornings find us early abroad with a view to rounding up peafowl, junglecock, partridge, pigeon, with shot gun and .22 rifle. We have to work hard for small results.

In this way several days pass, and then the down river buffalo is killed by a male tiger whose pugs show large in the sand. We see by the tracks that he was hunting along the reeds and bushes of the river bed; that he saw the buffalo and made rapidly towards it; that he swam across a small lagoon and then, quickly stealing under the bank beneath the dark shade of trees got within a few yards of his unsuspecting victim, the body of which is now covered with branches weighed down by stones. We have known a branch pulled aside by a prowling jackal expose a limb to the ubiquitous crow with the consequent arrival of hawks and vultures and the complete disintegration of the 'kill' and the loss of any chance at the tiger.

It was intended to be in position by three o'clock but we are late in leaving camp, so final screening operations are still being done when the coughing of the ever-watchful lungoors announce the tiger is on the move close by. The men hurriedly unscreen the carcase and make off up the river bed. The suspicions of the tiger have been aroused. He has heard movement at the place; and instead of appearing in daylight as he would certainly have done, keeps away until 10-30 p.m.

The moon is well above the trees, and the kill, in the shadow early in the evening, is now in the light, almost as clear as daylight, of a moon at the full. The stillness of the jungle at this hour of a breathless night can almost be felt. One could hear a pin drop. So when there is a slight rustle on the bank but a few yards away it is known who has arrived on the scene. After several minutes—well we know his attitude of intent listening watchfulness—we hear his heavy approach as he sets aside all caution and comes striding down the sandy incline to pass within twelve feet—less than that—of the muzzle of the rifle so soon to rend the peaceful night. Lifting the carcase with a quick movement, as is almost invariably done on first arrival, he finds it still hard and fast so stands, again intently listening, at gaze over the river bed. A jungle king indeed.

The rifle is raised, sighted and lowered. There is plenty of time, and such preliminary sighting shots are a guard against undue haste. It is the first shot which is all important. The stillness and beauty of the night is torn by the tremendous explosion of seventy-five grains of cordite. The stricken beast lurches to one side, collapses, and slides to the foot of the slope, shot through the heart and instantly killed by the terrific impact of the soft nose and split-bullet of five hundred grains weight. One moment standing in all his majestic strength and symmetry, the next his life extinguished, and his death even more merciful than that of the buffalo he slew a few hours before. He weighed 400 lbs.

A period of ten days elapses before the tigress puts in an appearance. For six successive mornings the tied-up buffalo is stalked at

— earliest dawn in hopes of that shot which, in common with stalking sleeping tigers near jungle pools in the hot weather, is the acme of a tiger shooting. On the seventh day we were weary of the dark and difficult walking over the stones of the river bed to the sandy patch from which the stalk commences, so take a day off. That very morning the tigress is found to have killed! One should never let up, but persevere to the end.

She was an unwary beast, or very hungry. Having slain the buffalo at about daybreak, as could be known by the tracks along the sand, she appeared shortly after four o'clock with the slanting sun shining fully through the tree-tops on her striped hide.

Previously to this three jackals arrive, and as the right eye had been giving trouble for some days a 'sighting shot' is taken on one of them, using left eye and right shoulder. In very early days the useful accomplishment of shooting with a rifle from either shoulder had been acquired, but the machan having been arranged for a right shoulder shot this third method of aiming is found necessary on this occasion—and not for the first time. The tigress frequently looks in the direction of the path through the forest along which the men visited the kill, so there is little doubt that she was feeding in the early morning. A memorable opportunity missed for want of one more morning's perseverance.

The soft-nose-cum-split bullet does instant execution as usual. Such a bullet is best for all sideways shots, the soft nose in the other barrel being used for chest shots, or when the bullet has to rake forward. Two 'dongas' (dug-out canoes) are obtained, and the poor tigress is peacefully floated down the beautiful river along the banks of which she had hunted for so many years; for she was quite an old beast, may be twenty years or more, her teeth very yellow and blunt, the left lower canine broken, the eyes filmy with the appearance of approaching blindness. It was afterwards regretted they had not been preserved for examination by an ophthalmologist. She weighed 280 lbs.

It was expected that some time would elapse before other tigers took the places vacated by these two animals, and so it proved. Another year, however, finds us at the same place: and making similar arrangements we await the pleasure of the tiger and tigress, successors to their departed relatives, who are now in possession. We do not, alas! have the same fortune, as the tiger is disposed of by a village shikari over a pet bullock some miles away, and the tigress is the wildest met with for many a day. She killed the upstream buffalo very early one morning, the tracks showing that when first sighting the tethered animal she stuck out her claws, whisked round, and galloped off to the jungle fifty yards away; but eventually came from another direction and killed. It may be she would have returned that night to meet her fate but fortune was on her side. The night's vigil was unrewarded, the reason being that while she was awaited in the machan she was feeding off a calf, chance met in the forest. A second vigil was also fruitless, but interesting as a large mugger issued from the pool close by and had a good feed on the kill. The wire tethering rope was proof against his efforts to take the carcase to the river.

Tracks and jungle noises showed the wily tigress to be still

in the vicinity, so another boda was led to take the place of the other, now almost completely demolished. Owing to mistaken kindness, a drink was given too soon after a feed on green grass so the severe colic which ensued prevented the buffalo going more than half way to the machan. It was left near a jamun tree which would afford sufficient roost for a chair, and where the tigress would be sure to find it if she hunted along the bank of the river.

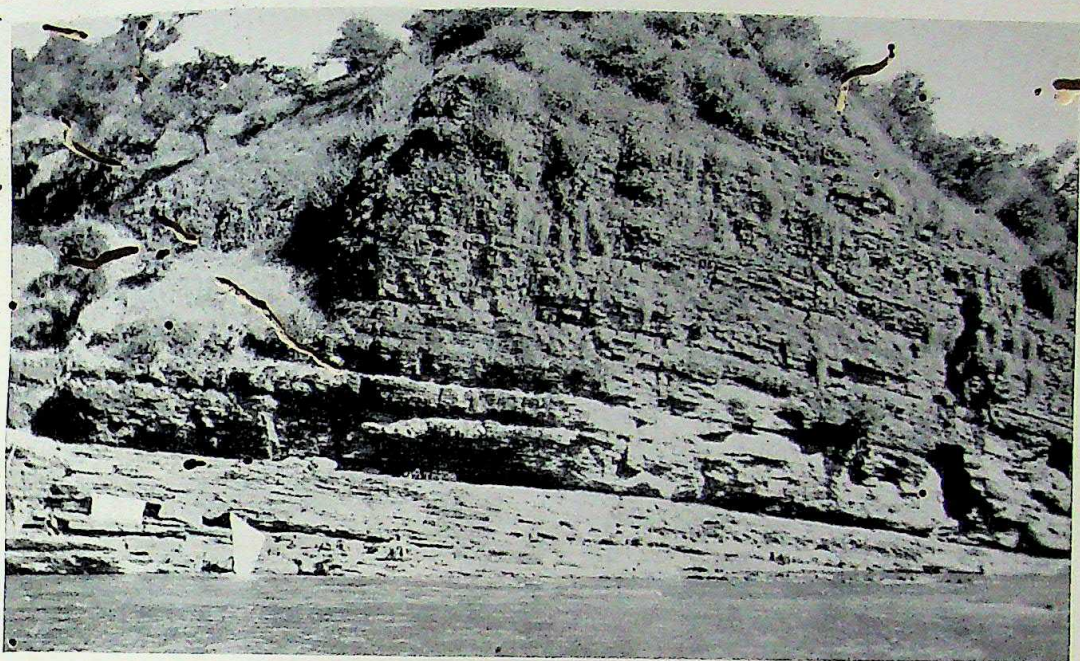
Sure enough she did. It was found that after slaking her thirst early in the morning as known by the drops of water in the sand she had sneaked along among the reeds in one place going belly to ground to pass under an arch of reeds, not eighteen inches high, then, rounding a small bush, she came right on to the boda? This was too much for her nerves for she stuck out her claws and raced off to the forest close by. The buffalo being ill—it died later—must have been lying very quiet: the tigress did not return. Had the buffalo not fallen ill she might have come along to the machan and killed it.

Twelve days later this same tigress came from up river, saw the boda, stopped, and went up the bank, had a backward look, went on to a place in deep shade and had another look, then passed on down river. All this being very plainly written by her tracks. Evidently a very cunning beast, and probably with some sharp experience to remind her of the danger attending a tethered bait! So we are tigerless on this trip.

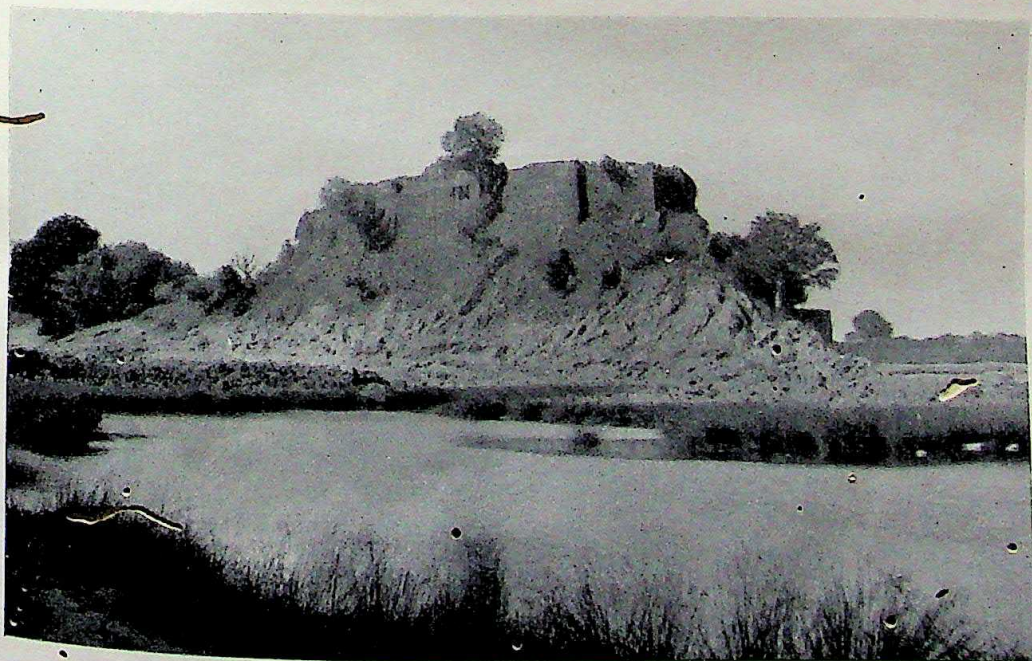
The ferry is close to the northern end of an island on which is a fort dating from the time of the marauding Pindaris. It was built by Amir Khan, a noted Pindari Chief who wisely entered into a treaty with the British Government and so, in the settlement subsequent to the battle of Mahidpur, secured to himself and his heirs jaghirs as price of his standing out of the war. Chitu, another Pindari Chief of the same period, although described as more sagacious than others of his kind, continued in arms and was hunted down like a wild beast all over the country until eventually he was killed by a tiger which devoured him in the jungles of Asirghur.

The Fort is constructed of boulders collected from the river bed, put together with mortar. It is protected under the Monuments Act enacted during the Viceroyalty of Lord Curzon. There are three tiers of battlements, many loopholes, but no gun embrasures. It is lozenge-shaped as is the island on which it is built. In places the walls are in course of disruption by the roots of banyan and pipal trees, those deadly enemies to all masonry in eastern countries. In the north-eastern corner are several former granaries, and two tombs said to date from the time of the construction of the fort (1795?); there is also a small Hindu temple of no architectural interest, and a Musjid, the white minarets of which can be seen from afar. Access to the river water was on the north side by means of a flight of steps leading to a well at the water's edge. Just here is a wide, deep pool fed by two rapids: a good place for gram baiting and an occasional five-pound mahseer by spinning bait or fly spoon; but it is much harried by the village fishermen. Two miles up stream there is more good water, but it is difficult and toilsome to fish this river, by means of dug-out boats, and often have I longed for the Berthon Collapsible boat of former days

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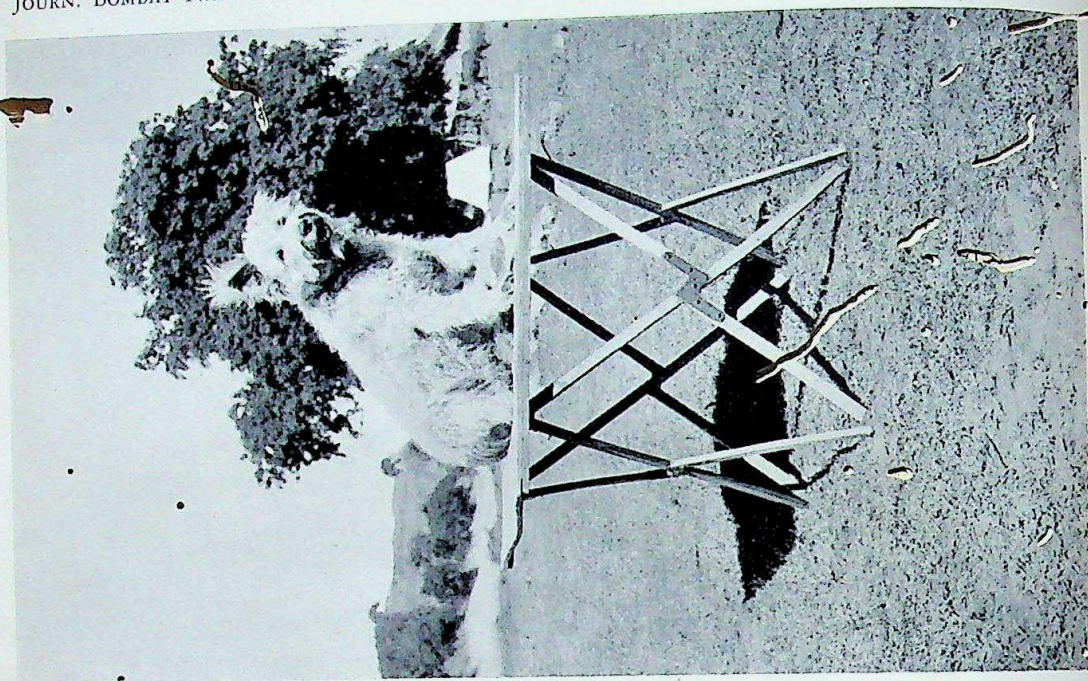


• Omkarji : The Sacrificial Precipice. •



• A Narbada Fort of Pindari Days

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"Simba"



A Kuku Amazon

for, apart from transport difficulties, the dug-out is unwieldy and noisy for river fishing of the kind one likes. A buffalo-hide and bamboo basket coracle of the pattern used in South India would be excellent, but would entail the importation of a man from those parts to work it. There is an American made rubber collapsible coracle which carries two people and is propelled by sculls. That would be a less troublesome boat. Indians soon pick up rowing, but not the coracle paddle, which is an expert business needing long practice and experience.

During these days of waiting tigers were actively killing on the Indore side, and the Chamars of the opposite village were early on the spot each morning. One evening about half past seven there was a great squealing of porkers from that direction accompanied by grunts of the attacking tigress, for such it proved to be. The noise lasted for twenty minutes, and a previous experience of the kind caused the remark that there must be cubs under instruction. In the morning the Chamars were early on the scene, and by the time I got there the carcasses of two pigs had been taken away. It seemed that the tigress had sprung amid the sounder and disabled two half-grown pigs by blows of her paws, as both the animals were slain within a few yards of one another. One carcase had been taken to the river bank and there placed beneath a jamun bush: the other into some long grass in a side nala. Tracks showed there were two cubs of three or four months: so instruction it was.

Panthers kept clear of tied up goats and bodas in an unusual fashion. None were killed, but one morning tracks of two panthers were noticed a few yards from a tethered goat. Perhaps the wind was favourable to the goat, and it was lying so still as to escape detection. That sometimes happens.

Our Irish Terrier of the Kerry Blue type, named 'Simba' because ten years earlier she was just a little lion cub in appearance, might have met a tragic end one evening when we were quietly strolling along a jungle path not far from camp. There were lungoors all unexcited in leafy tree so presumably no danger about; but, nearing the tree, beneath and around which was thick lantana, there, plainly to be seen from ground level, was a panther! Simba was at once chained, and our movement disturbing the crafty feline it was quickly detected by the ever watchful lungoors. Then there was no end of a scolding and swearing demonstration. Doubtless had we not appeared on the scene some one of the long-tailed party, descending unsuspecting to the ground, would have been seized for an evening meal. Simba was herself of yellowish colour and often sworn at by arboreal watchers as a possible enemy while other dogs of darker colour would be ignored. Dear Simba! One silky yellow ear cocked, the other flapping. She must be given a place of honour posed on a table at the Narbada camp.

Thinking of Simba turns thoughts to question of camouflage. The colour of one's clothes is important. A khaki coat hampers approach even to the forest doves. Most of us have recollections of a borrowed cultivator's blanket securing a shot at a black buck otherwise unapproachable in one's ordinary shooting kit. The simian tribe will scold and thus alarm all the jungle folk within hearing

when they spy the Sahib creeping about in a khaki coat. And that topped there is nothing like it in nature so it must be concealed by leaves kept in place by a band round the crown.

One thing leads to another; and this train of thought reminds me that from my very early days in India my gun and rifle barrels have been painted a dull khaki-green, but not all a uniform colour—stripes and blotches!—much to the disgust of the gunmaker who disapproves of his work of art being thus disfigured. It was instructive when crouched among the reeds on a duck jheel to see the wild swerve of the birds from a companion sportsman concealed on the further edge, any slightest movement of his gun being a danger signal to the wildfowl. As with guns so with fishing rods; how many fish have not been scared away by the flashing signal of a varnished rod? Modern craftsmen and anglers have neglected to paint their rods green after the manner so carefully instructed by Izaak Walton in 1653 and the many subsequent editions of *The Complete Angler*.

It is in the cold weather of a later year that inclination and opportunity find us again in the Narbada Valley and once more setting out from Punasa. A preliminary is a walk of some eight miles to the west to scout around for information and tiger tracks, the result being old and new pugs of a large tiger north of Borphal village: there is also news of several panthers levying toll of calves from the gowala's encampment close by: so camp is pitched in that neighbourhood.

The last rain in this area was on the 19th October so the tiger is located all right. The dews are very heavy and the nights cold in this first week of November. In spite of the people being in a half starved condition owing to severe agricultural depression they will not reduce their demand of eight rupees for a small buffalo calf. 'Gandhi Maharaj is our God,' say they; perhaps that has something to do with it. A Muhammadan attached to the camp as a Forest Guard introduces himself by intimating that the last Sahib gave him free rations, thirty rupees, and a watch! He gets five rupees for rations and will live in hopes of the rest.

It is interesting to wander several miles through strange forest and view the Narbada, now in flood. Several sambur are seen, also tracks of a bear, and not far from camp remains of a nilgai calf are discovered in the fork of a small teak tree, placed there by a panther during the previous night. Passing the same place on our return the panther is found to have removed his meat, so quite likely he was not far off when we first saw his temporary larder.

Not far from the river the villager shows a place where is a perfect hot-weather retreat for a tiger; from this small amphitheatre is but one entry and exit so Tom Puss taking his kill into that fancied security would be as good as bagged. In level country such places are rare: when found make a note! A peafowl, a hare, ~~green~~ pigeon are shot with the .22 rifle. The jungle is very leafy, grass and undergrowth thick in places not grazed down by cattle, and passing through it one gets soaked from the waist.

Next day the coming and going tracks of the tiger are seen on a path to the west, the return tracks clearly showing he was in a very bad temper about something, as he had torn up two teak

saplings with his teeth and violently raked the ground in several places. Perhaps he had failed in his stalk of some animal and did not like the idea of tummy rumblings for another day. A sambur with horns recently out of velvet and $39\frac{1}{2}$ inches long is shot much to the satisfaction of the villagers, the morrow being the day of the Diwali Festival. The village shikari assists in moving the beast for purposes of a camera picture and does not let on to his co-religionists that the Sahib's hands have pulled the animal about! There is questioning on the point when the cart brings the animal to camp but the shikari is a tactful man: what the eye does not see, etc.

On the night of the 9th November a calf was killed by a panther and about the same time the tiger passed by the tethered buffalo and refused to kill it. It is remarked to the men that he would probably return this night and take the bait; and so it proved. The machan is ready, and I should have been in it instead of avenging the death of the pretty white calf. That proves to be a fatal error. One should always follow one's intuitive knowledge in such matters. I *knew* the tiger would re-visit the bait but— —? no excuse. Little Ben, the black Cocker spaniel, is photographed with the third panther of his puppyhood.

The tiger's killing of the buffalo was particularly savage and there was blood all over the place, which is most unusual: he is clearly a bad tempered, savage beast. It sometimes happens that the tethering rope of flexible plaited wire is broken, and it is so on this occasion, the break taking place where soldering of the loop had been done. Joints should be plaited only, and not soldered. In most cases when that happens no harm is done as the tiger will return with less suspicion to a kill placed by himself; but there is not always a tree for machan, in which case it has to be dragged and arouse further suspicion. The kill is dragged forty yards so the prepared machan is of no use. Another is made, but the trees are small and the tiger must have detected it, as he gave no chance.

Two more all night vigils from another machan have the same negative result, and as the kill is very far gone we decide to strike camp and go to Makrar Ghat some miles up the river. The rough cart track is stony in some places, deep in tenacious mud in others. A yoke breaks and can fortunately be repaired by tools always carried on such trips as this. It takes an hour and a half to cut a suitable dry teak branch, shape it, and bore the holes for the iron neck pins. Were R. B. not able to do such jobs as this the camp would have had to be pitched on the spot, and a yoke obtained from some village, meaning a whole night of uncomfortable delay.

The early start which had been hoped for this short march of six miles did not come off; so it is past eleven when we follow along with the .22 in hand. The people are listless and lethargic from continual fever. On arrival at the camping site the shadows are fast lengthening and it is only possible to pitch half a tent for ourselves and one for the camp followers. Here, just above the high, steep bank of the river, it is much colder than at Borphal. The camp is in the forest and no habitations within several miles, though cattle graze up to a mile from where we are. The low hills are stony and covered with mixed forest and bamboos, while along the

banks of the nalas are large evergreen trees : here and there are open spaces covered with coarse grass.

During the night there are alarm calls of sambur, and in the nalas and along the sandy bank of the river are recent tracks of a tigress. It is interesting to notice how careful she is to keep in the shadows and take advantage of all cover and ground inequalities during her nightly perambulations. The river is several hundred yards wide in places and runs very strongly, for though much clearer the flood waters have not yet subsided to cold weather level.

It being obvious that the big tiger would one night certainly wander along the incoming cart track from the last camp, a machan is fixed in a tree where the path to camp leaves the main track. It is intended to pass each night in this machan, for one can slumber there as well as in camp, and hear all the jungle sounds. This is done for seven successive nights and then tracks of a tiger are found near the down river bait so the eighth night spent there. Fatal error! That night the tiger passed below the machan where is no bait and no rifle. The only compensation was the lovely sight of a tigress wandering along the further bank in full light of the setting sun. People at the camp viewed her amid great excitement.

Now the time limit for this month's permit is not far off so we return to the neighbourhood of the cattle encampment. It is found that the tiger visited the putrid remains of his kill on the night after the last vigil for him, and that so far gone was it that it fell to pieces on the way to the place where he removed the horrible repast, little but the skeleton, and some hide, surviving the drag. Truly the tiger is a foul-feeding creature, and no wonder that wounds inflicted by him have been fatal to so many sportsmen. Now that medical science has produced M & B 720 there is considerable prospect of recovery from maulings by tiger and panther as compared with former days.

On the evening of the 28th November a male panther is killed, without incident, over a tethered buffalo calf. This is the animal which some days before had removed a calf from amid the tethered herd without stampeding the cattle or rousing the watching herdsman. A skilful marauder. He is a beast of marvellous grace, a splendid athlete in appearance. There are fast-healing wounds on head and neck conjectured to have been caused by a rush through the barbed wire untidily festooned round some of the adjacent fields. The milk-white mother of the pretty calf slain by the former panther is killed some miles from camp—the work of two tigers, says the reporting cowherd, as almost all the carcase has been consumed. Carnivora take considerable toll of cattle in all the jungle tracts and as game decreases so does the killing of cattle increase: and in parts of the country where cattle are carefully guarded and difficult to obtain, and the game is greatly reduced, the carnivora have taken to killing the people. The Sironcha jungles and the Kumaon Hills are instances.

Now time is up and we move camp to Dharighat for a few days fishing having failed to obtain a permit for the adjoining shooting block, though it is vacant and not asked for by any other sportsman. Shabby treatment to meet out to an old shikari for reasons

that can be conjectured, but not mentioned ! The correspondence is treasured.

Thirteen days on the banks of the river produced half a dozen mahsir all between 5 and 9 lbs. The water was now clear but perhaps too cold, as sport was poor compared to the month of October on the former occasion. The diary records some marvellous sunsets: flaming skies of crimson and orange with a final glow as of an immense fiery furnace spreading over the great bowl of the heavens. There was light rain, as expected. The officials of the Dhar State on the further bank were kind and helpful in small matters of supplies for camp.

Four marches through a rocky and uninteresting terrain took us to a ferry thirty miles upstream where we crossed to the right bank by means of a large barge taking fully loaded carts, half a dozen or more at a trip. Camp was pitched near the village of Bagesar, the administrative centre of the Chandgarh Jaghir. The Mukhtear was helpful and politely hinted that the late Jaghirdar had not allowed people to kill peafowl and small deer. It was found that the wishes of the late Ruler as to this were strictly followed, and that the number and tameness of these animals and birds was markedly in contrast with Government Forest areas in the neighbourhood. It has been observed by the writer in several parts of India that the Landowners can, if they wish, exercise complete restraint in matter of preservation of specified species. What all the pains and penalties of the Government do not achieve is brought about by the 'hukam nahin hai' of the owner of the land. Similarly a religious embargo has great force.

In a few days a move was made to a pleasant camping ground in the vicinity of Chandgarh village six miles to the west. A small tigress was about but shied off tethered baits which she by-passed several times, neither did the local panther touch them, but he met his end through killing a calf in the centre of the hamlet of Jatam. The villagers did not protect the remains from vultures so there was not much left by the evening. However, the killer came to his grilled bones soon after dark and was slain by a chest shot. A fine panther; weight 125 lbs. His picture makes him somewhat resemble the beast on the fresco around the walls of the tea-room of the Tate Gallery in London. Little Ben's fifth panther; and he is getting more resigned to the joint photograph.

Bears are said to be feeding on fruit of wild plum trees a few miles to the east so a before-dawn visit is made to the place, with the result that a fine bear, seen at twenty feet and doubtless taken by 'Little Ben' to be his grandfather, for he stares at him in astonishment, is handsomely missed over the top of the back. In the darkness the rifle had been carried by the local guide, so the 200 yards leap was up. Such an elevation is never needed in jungle shooting and the leap should always be fastened down. The arrangement had come unstuck, hence a bear with a whole skin, for which we are not sorry.

One day a place called Keralia was shown where one of the men some years previously had roused a tiger sleeping among bushes by side of the path where is moisture and cool lying in the hot weather. The man was centre of several hauling a boat up

stream, so no doubt the tiger thought he was being 'encircled'. Deep scars of bites on the buttocks indicated just the sudden get-away attack one would expect under such circumstances. There would be no particular malice in it. It is in a forest clearing near the village that one early morning we meet a charming little Korku maiden with 'nodings on'. She stands all unconscious, with bow and arrow set to shoot at some fancied mark, a most pleasing sight. Alas! that one morning the camera is not with us. However it is possible to arrange a formal picture which is not so bad.

On the 14th January camp was moved to the left bank as first stage of a seven days bullock cart march to a good shooting block in the more hospitable Forest Division of Hoshangabad.

Mention has been made of Omkarji. For one reason or other the hoped-for up-river trip from there to Dharighat was not made, but a visit to the locality, which is an important place of pilgrimage, afforded much of interest. Omkarji town is on the left bank of the Narbada, while the Temple of Omkar is on the island of Mandhata.

It is a striking view which meets the eye as one descends the wide flight of stone steps below the town, the slabs of which are secured by iron 'dogs'—a necessary precaution in view of the annual monsoon floods. A wide stream, deep blue with the reflection of the cloudless sky on its placid waters; above the tiers of steps on either shore tower many temples and other buildings; rugged, boldly stratified rocks, of a greenish hue, surmounted by yellowing forest of teak trees; crowds of people of all ages, sexes, and castes in gay apparel of many hues; boats of several sizes busily conveying packed loads of pilgrims to either bank; and small naked urchins in dug-out canoes eagerly diving for coins thrown to them and almost as much at home in the water as the fish and the crocodiles.

The river is full of fish. Mahsir up to twenty pounds can be gathered into splashing shoals by the throwing of a handful of parched grain. How one would like to 'fly fish' with monkey nut!

For three rupees a roomy boat is hired to take us up stream. We pass beneath the precipice at the eastern extremity of the island. It was from this rugged hill-top that voluntary human sacrifice used to be performed before the country came under British Administration after the year 1824. It was in that year the last sacrifice took place. It was witnessed by a British officer who vainly endeavoured to persuade the devotee, a lad of twenty, from hurling himself to destruction. A vivid description of all that took place is on record. The final act of the dread drama was the figure of the man standing on the brink of the precipice, in view of the hushed and expectant multitude, with arms outstretched while making the final invocations. Then he disappeared from view, to re-appear in a manful running leap silhouetted against the sky. Thus he fell half way, and then, striking a projecting rock, fell headlong, to be dashed to pieces amid the roar of voices on the rocks below.

As we pass up the placid stream we see men at work smearing a huge slab of rock with bright vermilion paint. They also put splashes of paint along the foot of the wall of the precipice, which they hand-mark with extended red fingers. An hour later, returning down the river, we see that the sacrifice has been completed; not

by the death of a sentient human being voluntarily hurling himself to destruction with the acclaim of fifty thousand throats, but by the cutting of the throat of a poor little kid whose life-blood smears the sacrificial rock—that very rock on which the devotees of a century ago were dashed to pieces—and whose entrails are being washed in the sacred stream to form a meal for some of the attendants: for though a formal sacrifice there is no need for waste!

Six miles below Mandhata is Mortakka, where the river is spanned by the road and rail bridge. It was fishing down stream in 1906 with a companion that the canvas boat sank, committing us to a lengthy swim before touching bottom. We lost the boat and all our rods and tackle. 'I have at any rate salvaged my boots,' says S, jubilantly. 'My boots,' say I, at once recognizing cork-lined surgical boot which had naturally come to the surface! It was not until later that we knew we had swum through the many crocodiles living just there to feed on the more or less burnt remains of devout Hindus committed to the sacred stream from the funeral pyres on the sandy foreshore. There was no danger, as the saurians are not accustomed to 'things' that swim.

This below-bridge reach of water used to be a favourite locality with anglers from the Mhow Cantonment. Excellent swims for gram baiting.

Now comes the final leave taking of 'Narbada Mai'. Perhaps we may never again enjoy halcyon days along its banks, but the memories are always with us.

A MONTH IN THE KAZINAG RANGE.

BY

LT.-COL. R. S. P. BATES, M.B.O.U.

(With eight black and white plates).

Thanks to the unsettled times in which we are now living, a month's leave was all I could obtain. The problem which arose therefore was which would be the most profitable area to work and the quickest to reach in the time available. Finally my wife and I fixed on the Kazinag range, as records of what birds those mountains contain are noticeably few and far between—not that we expected to find anything startling, but it appeared to afford a good opportunity of extending our knowledge of the distribution of Kashmir's birds.

The Kazinag is that range which starting at Baramullah closes the western end of the Vale of Kashmir, providing a stopper as it were to the monsoon between the Pir Panjal and the ranges enclosing the Kishenganga Valley. The north-eastern slopes are drained by numerous short and charming torrents going to swell the Pohru river which itself takes source in the extreme northern limit of the range. These slopes are clothed from almost valley level to between 7,000 and 8,000 feet in magnificent deodar forests which, except for a stretch along the Kishenganga Valley and in the Lolab, occur extensively nowhere else in Kashmir. Amongst the deodars there are of course other trees but this beautiful cedar predominates. At about 7,500 feet where they cease the forest assumes a more mixed character gradually becoming almost exclusively coniferous again as the 10,000 feet level is approached.

The birds of the deodar zone are mainly those of the same levels anywhere around the main Vale and its side valleys, but certain species are scarce—if not quite absent; it is hard to be sure on a month's tour—while others are more common than elsewhere; and one, the Slaty-headed Paroquet (*Psittacula himalayana himalayana*) has his headquarters exclusively in this zone, though parties raid out into the open valleys and spread further afield after the breeding season is ended and the maize has ripened.

We spent the night of June 3 at Baramullah, heavy rain having rendered the fair weather motor road to Handwara quite impassable.

Before leaving the next afternoon in a ramshackle bus whose front springs eventually proved unequal to the strain imposed upon them by that dreadful road, I noted that Slaty-headed Paroquets were not uncommon in the gardens though I only heard and saw single birds. That night we camped where the derelict bus had deposited us, in the vicinity of the bridge over the Pohru river two miles short of Handwara. Shortly before dusk I noticed two huge flights of Jackdaws which appeared to be heading for Sopor. Throughout the hours of daylight Daws were to be seen carrying food to holes in almost every walnut and chenar tree, so what

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EASTERN JACKDAWS (*Corvus monedula soomeringii*)
Three pairs had young in holes in this one walnut tree.

birds went to make up these enormous evening flights I cannot imagine.

Our objective next day was Sanzipur 11 miles away, but I blush to call it a march for we annexed an ancient tonga, the driver affirming that he could put us three miles upon our way. Thanks to his dexterity in negotiating a much-damaged culvert, he eventually deposited us right at the gate of the Forest Rest House. The excuse for our ultra laziness was to be found in the presence of a Golden Cocker pup for whose legs exercise was still taboo. Needless to say he ran quite wild in the Sanzipur woods, covering many more miles in one hour on his fat little feet than we ever did in a day.

As we broke camp I noticed Paroquets were numerous, for small flocks appeared quite frequently zooming across the river with harsh squeals to the cover of a bagh near by. The bright yellow terminal third of the tail would be a perfect distinguishing mark were any needed, but the Slaty-headed Paroquet happens to be the only member of the Psittacidae occurring within Kashmir proper.

Although Sanzipur is but 500 feet above main valley level, differences in its birdlife were quite apparent. Most of the Valley birds one would expect to see did occur, but some of these were already rare while a few quite common species were missing altogether. I saw no House-Crows, Starlings, Kingfishers or Paradise Flycatchers. Orioles were uncommon and Tickell's Thrushes very scarce. On all the side rivers running into the main valley from the north I have always found Sandpipers exceedingly numerous from the moment the slack waters are left behind right up to 10,000 feet and even higher. On these Kazinag torrents however, many of which are of fair size with plenty of low bushy cover along their stony margins and divided by many suitable islands, I saw one bird the whole trip, at Kiterdarji on June 27. On our return march to Baramullah as we dropped down to the stream at Panzal I did however hear the unmistakable querulous chittering of these birds being wafted up the hillside on the warm air of the lower valley.

But to go back to Sanzipur. I was struck by the appearance of species normally connected in one's mind with higher altitudes. Meadow Buntings (*Emberiza cia stracheyi*) occurred in small numbers in suitable areas, although this is the elevation where around the not so distant Wular Lake and on the rather arid slopes on the northern rim of the main vale, Stewart's Bunting (*Emberiza stewarti*) holds the field, the Meadow Bunting being quite absent. I had always considered the former as breeding up to about 6,000 feet only and then having its place taken by the Meadow Bunting. In fact I have often stressed that during the breeding months the habitats of these two species do not overlap. Yet at the end of June near Chak-i-Lal Singh, 5 miles from Baramullah where one crosses the last spur, I came upon both species in the same area, on grassy bush-dotted slopes not more than 200 to 300 feet above the valley. The presence of Meadow Buntings is often first given away by their very subdued mouse-like squeaks which they seem to keep up when feeding through long grass.

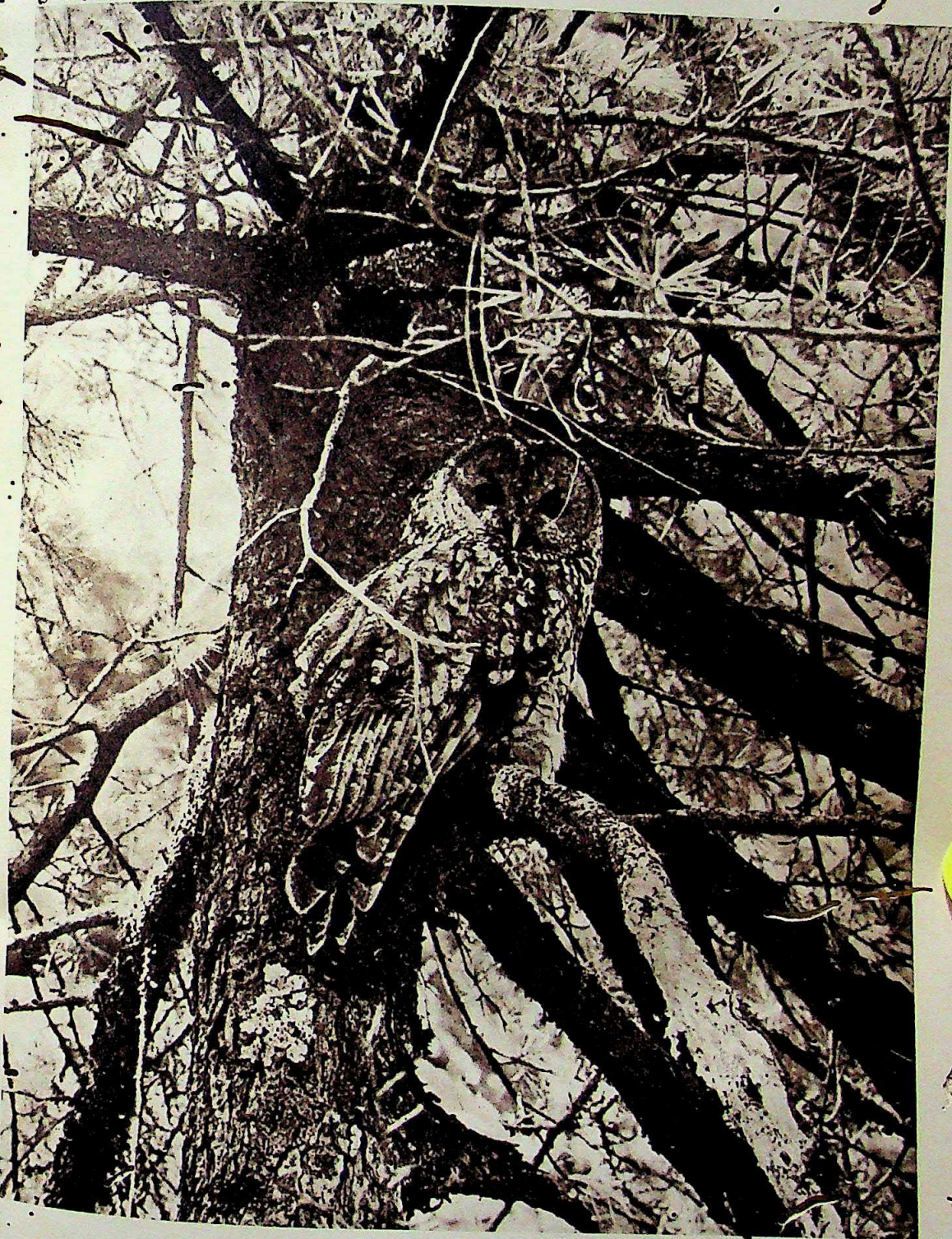
and concealing cover, perhaps by way of apprising each other of their whereabouts or of giving warning.

There were a few pairs, very few, of Dark Grey Bushchats and I also on occasion heard the Pale Bush Warbler (*Horornis p. pallidus*) well within the forest though there was generally a parrotia dotted clearing of sorts not far off. This shy little bird is not uncommon within the State *rukhs* at Achhibal so there was nothing very startling about its presence at this elevation; a point to note however is that in its higher range it seems definitely to avoid forest.

I disturbed a pair of Yellow-billed Magpies in the wood by the Rest House and came upon a Blue-headed Rock-Thrush there seated upon 4 fresh eggs. Cinnamon Sparrows started half a mile further up the valley at Vihom village. But what did surprise me was the scarcity of Hume's Lesser Whitethroats in country which seemed eminently suited to their habits. It is not many miles to those slopes around the Wular Lake where this species is so very common, but except for one pair seen at Sanzipur—I later found their nest in a rose bush—I never saw this bird in the Kazinag. Of course some birds were very numerous—Jackdaws, Mynas, House-Sparrows, and last but not least Slaty-headed Paroquets. It was evident however that we were at an intermediate elevation where species were many but individuals rather few.

On June 20 I had my first dealings with a Paroquet at its nest-hole, but that was a red-letter day for other reasons. Three times in the same locality, a deep shady nullah running up into the forest directly behind the F.R.H., we had come upon a Scully's Wood Owl (*Strix aluco biddulphi*), once on the pair of them. I could however find no nest although they seemed rather bold and, when accompanied by the Cocker, we were followed by one of them for about a hundred yards. I decided therefore to try a ruse which seldom pays. I screwed the stand on to the reflex, put in a filmpack, and fixed the strap round my neck. Walking quietly through their usual haunts I drew an absolute blank, but in spite of my awkward burden I fortunately did not give up hope. Crossing the little stream I tried a particularly gloomy patch of forest on the opposite side of the nullah. Quite suddenly I realised I was within twenty yards of an Owl roosting on a lower branch of a deodar and not eight feet from the ground. I approached quietly, not daring to look at the bird lest it take fright. When about 25 feet away I spread the tripod legs and started to focus; none too easy in so poor a light. However I stopped right down to make sure and exposed a couple of films giving one 5 and the other 15 seconds, during which the bird stared fixedly at the lens but with no undue signs of fear. Moving forward a few paces at a time I exposed a couple of films at each halt until I had used up eight and was hardly 12 feet from the bird. After the last exposure it seemed to have become so used to the procedure that it turned away its head, yawned deliberately, and closed its eyes. Emboldened by this extraordinary behaviour I moved still nearer, but when I looked down into the focussing screen the branch was bare; the owl had taken its departure as silently as a ghost.

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SCULLY'S WOOD OWL (*Strix aluco biddulphi*)

Stalked as he was indulging in his daily siesta on the shady slope of a deep nullah.

At the bottom of the slope the Blue-headed Rock-Thrush was sitting on her eggs. As usual she allowed me to stand right over her, merely putting on that strained look so typical of the Thrushes when disturbed incubating. Unfortunately there were a couple of twigs and some leaves in the way so I could not repeat the Owl performance and photograph her without the hide.

It was still quite early so we climbed half a mile up the wood to a point where I had remarked signs of activity among the Paroquets (*Psittacula h. himalayana*), so much so that I already had a strong feeling that these birds were perhaps colonial in their breeding habits. Actually I had only marked down one hole which I suspected to be occupied but this quarter of the wood seemed always to be tenanted by Paroquets talking confidentially to one another. This was a circular hole considerably larger than that of a Woodpecker about 18 feet from the ground in the trunk of a deodar.

As we approached I was thrilled to see the head and shoulders of an adult Paroquet protruding from it, so we quickly erected the hide. The slope of the ground was so abrupt that I got the camera comparatively close but even so the lens was tilted at such an angle that the photos I got that day were mere silhouettes against a cloudless sky. The female came back quite soon and stood for some minutes on the perch near the nest and then sidling along the branch levered herself into the hole with the aid of her beak. A woodcutter I sent up the tree said he could make out the edges of two eggs about eight inches to a foot down. On our way back through Sanzipur a fortnight later we could not make out what the hole contained, but the female seemed still to be sitting. This time we built up a platform and erected the tent upon it in the evening; partly so that I could get to work early before the sun got too high in the sky, and partly because birds seem to be less frightened of a new structure erected in a fading light and become quite accustomed to its presence during the hours of darkness. On the way back we faked a dummy hide 7 feet from the Blue-headed Rock-thrushes which now had three young ones in place of the original 4 eggs, and pushed a large black fir cone into the front to represent the lens.

I returned to the Paroquets at 9-30 a.m. They seemed to be getting used to us, for the sitting bird did not leave the hole until we had been there some minutes and I was almost ready to get into the hide. She was back on the perch very soon after I had been left alone, giving me time for only one exposure before she clamboured in. I've called her the female but there was really nothing to go by as to which parent it was.

And now ensued a long wait. My patience started to give out. Nothing happened. The wood settled down to utter stillness but for the tapping of a Woodcutter's axe in the distance, and at last I decided to call up the shikari to shift the sitting bird. Fortunately I hesitated, for a few seconds later my boredom turned to feverish activity. With husky screams a band of Paroquets came twisting through the wood; the next moment my startled gaze beheld no less than five paroquets on the perch and clustered round the hole. There were three adults with bright

yellow tail-tips and slaty faces, and two youngsters short-tailed by contrast and a uniform dull green all over. Were they a neighbouring family escorting the head of the house to his front door? The lady within evidently did not care a hoot who they were and took not the slightest notice. In fact, to begin with I was not sure that she had not slipped away unawares but about ten minutes after the roysterers had taken their departure as noisily as they had come, she poked her head out of the hole, had a look round and slowly withdrew to continue her duties.

First one of the youngsters had a look at the entrance hole, upending himself on a small branch above it and craning his neck to get a better view. But soon one of the adults took possession; perhaps he was the owner. At any rate he seemed the odd man out of the five. I was quickly at work using a so-called silent shutter, which in actual fact made just sufficient noise to attract the audience's attention without frightening them. I was able to take 7 photographs employing short time exposures, as the scratchy noise of the shutter and the slight sounds I made changing plates merely caused them to freeze in grotesque attitudes. Eventually they dashed off for no apparent reason just as suddenly as they had appeared.

To keep all my observations on this bird together I will relate here the remainder of my contacts with them. When we left Sanzipur we first went to Bungus and then back to Nildori. Now Nildori is approximately 8,400 feet. In that locality and at that elevation I never saw a paroquet. It was not until we dropped down into the deodars again that we met with them. Unfortunately I am not sure of the elevation at which these trees recommenced but it was below the 8,000 foot mark. There certainly seems to be a connection between the distribution of the deodar and the Slaty-headed Paroquet in this part of the Himalayas. After the breeding season they certainly spread further afield. Osmaston records them at Gulmarg in August, and Colonel Ward states that in the autumn bands of them visit the side valleys, Sind, Lidar etc. This wandering is undoubtedly correlated with food supply. In many different villages I questioned cultivators about them and always received the same information. They do little damage to the rice but much to the ripening maize and this of course ripens in the late summer and early autumn. They also attack fruit and in the spring the apple blossom.

I had my final proof of their love of company on July 2 when on our way back to Baramullah. At Panzal, 9 miles therefrom and only a few hundred feet above the level of the main valley, the path skirts the lowest rim of the forest. As we left Panzal we cut through a little tongue; it amounted to what in the Plains would be called a *bagh* and consisted mostly of chir pines with about half a dozen very tall birches scattered amongst them. The latter were tenanted by colonies of slaty-headed paroquets—unfortunately I omitted to inspect the pines. On the side facing me of one birch I counted five holes, three of which, definitely occupied ones, were hardly two yards apart. Many of the holes were far from being perfect circles, a few of them being somewhat unsymmetrical ovals with the axes at no particular



LATY-HEADED PARQUETS (*Psittacula himalayana*)

Regardless of the fact that this delectable residence was already occupied, a party of three adults and two young ones suddenly arrived to inspect it.

angle. They varied in size considerably; from little bigger than that of a Pied Woodpecker through which the birds squeezed with difficulty to about 4 inches across. The lowest was about 20 feet from the ground while some I estimated to be 60 or more feet up. I saw three or four birds entering and leaving holes while all the time there was an incessant screaming from birds conversing with one another or from small bands weaving swiftly in and out of the trees. These bands contained numbers of immature birds and seemed to be family parties whose nesting for the year was over and done with. Watching them was intensely interesting but alas we were on the move and could not afford to stay.

After that digression I must return to the description of this trip in its chronological order. As there seemed to be nothing at the right stage to photograph, on June 11 we decided to move from Saziper to Bungus, a large *marg* lying at approximately 9,700 feet under the main slopes of the Kazinag. As the Naugam F.R.H. was but $2\frac{1}{2}$ miles up the valley, we decided to leave it out and do the march in one. Within less than a mile we crossed a wide almost dry *nullah* bed and walked past the little village of Vilom where I at once noticed that the sparrows flitting about the hedges were cinnamon-headed. It is extraordinary how at times new species appear in numbers with complete suddenness. Entering the shady woods at Naugam we still followed the course of the river for another mile before turning abruptly up the hillside. Birds were few amongst the deodars and little of interest appeared until we suddenly reached the crest of the spur enabling us to look into a broad amphitheatre dotted with widely-spaced pines all of which seemed to have been blasted by lightning or killed by disease; rather a striking sight, especially as soaring majestically heavenwards with but a tiny whisp of cloud trailing from its summit to offset its beauty, there floated over the bowl's further rim the snow-white outline of Nanga Parbat, the unbeaten giant of the Western Himalayas, many miles distant but none the less an amazing sight. To our right I heard the flutelike triple whistle of a Black and Yellow Grosbeak, a bird whose call is as attractive as its brilliant plumage, while the Small Cuckoo was abjuring 'our smoky pepper' from a distant perch.

Following the crest of the ridge in order to reach the first pass into the little valley where lie a couple of Gujar huts and the charming *marg* called Nildori, I suddenly realized we had left the deodars behind and had entered a new bird world. We would then be about midway between 7,000 and 8,000 feet up. Chocolate and white Spotted Nutcrackers became very common indeed but unfortunately pair after pair seemed to be accompanied by their young. I investigated two nests, both 30 to 40 feet from the ground, which agreed well with the description in Volume I of *Nidification*; but the young had obviously left them days before, so I think their nidification must end normally by the end of May. This bird is far more numerous throughout the Kazinag, from a little beyond 6,000 feet up to at least 10,000 feet, than anywhere else in Kashmir, and I am equally sure that no other bird in that State produces more extraordinary noises. Their calls, if one may

use that word, range from wheezy crowlike caws to piggish squeals which they sometimes produce unceasingly for minutes at a time while concealed in the summit of some dense fir.

Tree-Creepers, Tits, Flycatchers, and Grey-headed and Missel Thrushes, now became common. I heard once more the sweet rapid song of the Kashmir Wren, the agitated chucks of the Tied Woodpeckers, and began to note many birds of the higher elevations, but I am sorry to say that when at length we attained the last summit and looked across the great stretch of the Bungus marg, we were very disappointed. Rainfall had been excessive and the unbroken stretches of green showed deeper patches of colour where the ground had become little more than swamp so that before we reached the tiny, and I regret to say decidedly draughtly, forest hut, we were soaked to the knees, so water-logged had it become. As far as the eye could see sheep dotted the landscape, hundreds upon hundreds of them, not only keeping the grass short-clipped but producing a flowerless land where we had hoped for colour and beautiful blooms. Dwarf irises and a few fritillarias were alone to be seen. The surrounding woods were rather thin with acres of fallen trunks on the flanks of the steeper spurs where the crushing weight of slipping snow had battered them down. There and then we decided to keep on the baggage ponies, stay at the hut for one complete day, and then retrace our steps to Nildori which looked such a charming little spot and certainly far more hospitable—after all we were on leave and supposed to be enjoying ourselves.

The following morning I found a White-capped Redstart (*Chaimarrhornis leucocephala*) sitting on a nest of 4 eggs. It was really somewhat conspicuously placed in the upturned end of a fallen trunk close to an almost dry stony nullah running into the woods behind the hut. The bird sat tight allowing us to inspect her at close quarters. I also found a wren's nest tucked into a crevice in the bark on the underside of a fallen tree and so well concealed from view that it was quite impossible to bring the camera lens to bear upon it. I stuffed up the entrance hole with my handkerchief and then focussed on a fallen stick which the bird used as its final pitch on its way to the nest. I did not get good results, however, as the light was too poor to enable me to cope with its very quick agitated movements. In the evening I was brought a Witherby's Pipit, a female shot off the nest. The 4 eggs were nearly ready to hatch but I eventually managed to blow them.

On June 13 we retreated the few miles to Nildori and pitched our tent at the extremity of the flattened spur at the northern end of the narrow little marg. It was a charming little spot, well sheltered on both sides and behind by woods carpeted with sky-blue Jacob's ladders and with a clear view of three 14,000 feet peaks directly ahead. For the time of year these had an inordinate amount of snow upon them.

We were glad to have come down from Bungus. I have described the Kazinag range as a stopper. Almost every afternoon clouds from the direction of Uri would attempt to sweep over their crests into the main valley, and alas we struck a period when

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WHITE-BROWED BLUE FLYCATCHER (*Cyornis s. superciliaris*)

The male often fed his mate at the nest, thus relieving her of the necessity of leaving her newly hatched young.

for the first few days of our life in tents they succeeded in doing so. During the second afternoon we had a terrific downpour accompanied by perfectly deafening thunder. We afterwards learned that it had been the cause of depriving Srinagar of its electricity for a couple of days.

On our way up to Bungus I had noticed a pair of Tree-Creepers (*Certhia h. himalayana*) obviously with young in a narrow slit in the bark of a deodar about a mile from camp. The nest was not more than 7 feet from the ground and close to the path; so off we set at the first opportunity burdened with cameras, the hiding tent, and our tiffin. In direct contrast to a very bold pair I once photographed at Sonamarg, both the parents proved shy. It was an hour before one of them plucked up courage to poke more than its head into view and slither rapidly into the hole with a scratchy sound of its thin claws over the intervening bark.

Slither is the correct term and they slithered about the trunk in such rapid jerky little runs that I found it difficult to get off exposures except by using a large stop and a very short exposure. I have certainly taken better photographs but they show off the close barring of the tail feathers of this species very well.

After about two hours work on the Tree-Creepers, we moved back along the path to an old stump with many rotten little cavities in it. One of these held a minute mossy nest of the White-browed Blue Flycatcher (*Muscicapula s. superciliaris*). This is perhaps the most common Flycatcher in the Kazinag and occurs everywhere in the forests from their lowest levels. I also found two nests in quite small orchards at not more than 6,000 feet. The males are easy to identify in spite of their rather unobtrusive habits as their colour pattern of dark blue and purest white is so distinctive. The upper parts appear blue in their entirety except for the conspicuous white stripes over the eyes, widest and all but meeting on the nape. The blue is continued in a broad collar on either side of the breast which however is always interrupted in the centre to a greater or lesser extent. It is not given to conspicuous flights after insects from a fixed perch like the dull-coloured Sooty Flycatcher but its subdued oft-repeated attempts at a song serve to notify its presence whenever one is sufficiently close to hear them. 'Te-che-prrr' it says, dropping its voice considerably on the 'prrr'.

This couple proved easy subjects with the lens but 7 feet from the nest, coming back within five minutes of my being left alone, the female to brood her microscopic babies, the male to bring food both for her and the chicks. He fed his wife at the nest, apparently relieving her of any necessity of forsaking her charges at such a tender age. On his first visit he presented the very aspect I most desired to portray, showing off his interrupted blue breast band to perfection. Unfortunately to let them get used to the lens and hide I let both of them put in a couple of visits before starting photography, and this turned out to be the only time on which the male did not present his back to me.

On the way home I watched a couple of pairs of Missel Thrushes but could find no nests. The Missel Thrush is a bird of particularly wide altitudinal range in Kashmir, in the breeding

season living in the forest areas from their lower levels at about 6,000 feet upwards and gathering in the late summer and autumn into flocks which find their way to the very limit of the birches at between 12,000 and 13,000 feet. Near the top of the ridge sweet smelling cream columbines were growing.

After this we spent most of our time much nearer home. The wood behind camp was of a very mixed character with clearings here and there dotted with old stumps, bushes and a little juniper. There were also a number of short steep-sided ravines with little trickles and a few muddy patches in their beds. Such country naturally held many species of birds. Tits were scarce, rather to my surprise, but woodpeckers whose nesting was over abounded. Grey-headed and Missel Thrushes were common. I found three nests of the former, one very conspicuously wedged in the first fork where the main trunk of a tree divided about 12 feet from the ground, the other two being, as is so often the case, well hidden in the crowns of young firs. Amongst the bushes in the clearings I found nests of Meadow Buntings, two Jerdon's Hedge-Sparrows, a Blue Chat's, and a Streaked Laughing Thrush's with two young ones in it. This last nest was very bulky for the size of the bird, a somewhat loose structure of dead grasses. Willow-Warblers of course abounded, particularly Ticehurst's (*Phylloscopus proregulus simlaensis*), which I learned to trace to its almost invisible little nest in the ends of the fir branches by listening for its sharp monosyllabic 'Tsip' and then watching it carefully to its lair.

The Hedge-Sparrows we left alone as we had one on an outer branch of a fir not 20 yards from the tent door. I photographed the female on this. It was a beautiful structure, a foundation of quite stout sticks padded with quantities of moss with a thick felted lining of wool, hair, and a few feathers. The whole was intermixed and covered with a layer of a stringy almost white lichen. The female was most amazingly tame and sat on while we raised the sheltering branch immediately above and tied it back out of the lenses' vision, after which I took long-time exposures of her with the silent shutter.

How many people realize that Jerdon's Hedge-Sparrow is no mean songster, its lay being not unlike a Wren's but not so boisterous and penetrating.

Late one afternoon we sauntered along the flank of one of the short ravines. As we neared its head the forest closed in, so, finding it rather gloomy in the fading light we crossed over to return on the other side. It was then that we had one of those outstanding experiences of a lifetime, something to be looked back upon in years to come as an episode never to be forgotten. As we made our way through some bushes on the edge of a more open grass-carpeted slope there arose a strange croaking. First I thought it the production of Nutcrackers but it came from the ground hardly 20 yards away. We called in the Cocker spaniel and pushed forward. I was rapidly coming to the conclusion that a hawk or owl had got some luckless victim in its talons, when my wife shouted that two large birds had left the ground just in front of her and were flying downhill towards the bed of the nullah. I emerged from the bushes just in time to see a pair of Woodcock

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• JERDON'S HEDGE-SPARROW (*Prunella strophciata jerdoni*)

The soft nest of moss, thickly lined with hair and a few feathers, was plastered with almost white lichen.

A MONTH IN THE KAZINAG RANGE

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(*Scolopax rusticola*) wheel into some cover near the boggy stream below. But where was that easy almost owl-like flight? They flew heavily with tail spread wide, seemingly weighed down behind. And they kept up that strange croaking even after pitching into cover.

We tied up the dog and I started down the slope. Suddenly croaking broke out anew hardly 15 yards below. One of the birds had returned while my attention had been taken up with the dog. I saw a Woodcock on the ground. Its wings were spread wide with the tips drooping into the grass, the tail fanned out, and the body upraised at about 45° with the bill pointing downwards. Croaking and groaning harshly as I rushed towards it, it started into flight, but it was evidently unable to use its legs for the take off so that it dragged down the slope for a yard or two beating the earth with its wingtips before getting clear. Even while flying its body remained at the same awkward angle and it rose but a few feet off the ground coming heavily to earth 30 yards further down.

This time I made a still greater effort to catch it in an attempt to elucidate the cause of its strange antics. I could have laid it low with my khud stick, but it just got clear as I stretched out a hand to seize it and succeeded in crossing the nullah where I lost all trace of it.

I think it is now taken as an established fact that Woodcock do carry their young for two purposes, namely to get them to distant feeding grounds and to remove them from danger. I have read various accounts at different times but there are still those who contend that a point still at issue is the actual method of carriage. Unfortunately in this instance the birds throughout were facing away from me, making it quite impossible to see not only the method of transportation but any burden whatsoever, though of course it was quite obvious that they were carrying something. And does this croaking always take place as a matter of course or was it the sudden entrance of our spaniel which caused the commotion?

Nildori provided so many points to explore that even at the end of ten days I felt that we knew but few of its treasures and still had half a dozen potential photographs in view. But a very large slice had already been taken out of our month so we felt it to be time to move to fresh fields.

We returned to Sanzipur on June 21 stopping there two nights to cope with the Slaty-headed Paroquets. After finishing with those interesting birds, I moved the tent to the Blue-headed Rock-Thrush's (*Monticola cinclorhyncha*) nest in front of which I had previously erected a dummy hide. It now held three well-nourished young ones in place of the original four eggs.

It is just 20 years since I first attempted to photograph this beautiful but allusive Thrush. Anyone who has come upon a nest and has noticed the outraged demeanour of the female thereon, sitting as if nothing short of a forest fire would force her to leave, would imagine that there could be no easier prey for the bird photographer. Unfortunately there are few birds' nests in front of which one can just put down the camera and get busy. There

is almost always grass or leaves or some obstacle requiring removal to give the lens a clear view, and once flushed off the nest I have never yet met a more suspicious nature than is possessed by both sexes of this rather common bird.

On this occasion I used an almost silent 'luc' shutter in the extension box on the front of the reflex, and was gratified to hear almost immediately one of the birds in the parrotia scrub close to the right side of the tent. Suddenly it flew straight to the nest and there I beheld the blue and chestnut male standing in strained silence upon its rim while the young ones clamoured for food. I had set the silent shutter for brief time exposures, not venturing to use the clattering focal plane. I pressed in the release letting it go again almost as quickly as I could thereby giving about one quarter of a second. The slight scratch of the shutter leaves caused him to listen intently so that I dared not attempt to change the plate. Full of suspicion he eventually flew off without feeding his babies and that was the very last I saw or heard of either bird. One slight scraping noise had been sufficient to convince both of them of the worst. Still, although I possess only that one negative of the male, I can hardly complain.

My next encounter with this species came a few days later at Kiterdarji, our last resting place. It is only about half a dozen miles from Sanzipur and about the same elevation. To reach it we crossed a couple more of the charming tributaries of the Pohru river, since we made our way directly across the lower spurs of the Kazinag. The country was lovely; forest glades and parkland alternating with fields of ripe corn, acres of linseed nearly as blue as the sky, over which the larks rose and fell singing their loudest, while at the lower levels the rice was being planted out to the accompaniment of the monotonous yet fascinating chants of the peasants.

This time the Rock Thrush's nest was balanced on a narrow ledge on a decaying stump. It was quite open to view and close to a cattle track through the forest. When first discovered the female continued to sit on her newly-hatched triplets as still as a rock seemingly as bold as any bird could be, yet to get a glimpse of either bird, even from afar, visiting the nest with food was quite impossible. First I left a dummy hide in place for a couple of days and the real one for the best part of another twenty-four hours. When I got inside I waited patiently for an hour and a half but nothing happened. I had taken the greatest care in entering the hide, getting the shikari to stand close to me while I went in through the back. Halfway through the morning I took a short time off in order to try a new dodge. On my return my wife and the shikari both tucked me in and went off carrying an empty coat between them. Now, can these birds count? Or was it sheer coincidence that the male should fly straight to the nest not five minutes later, and almost immediately afterwards the female, seeing the rim of the nest occupied by her husband, landed on a dead stump midway between the lens and the nest so that she was hardly three feet from me.

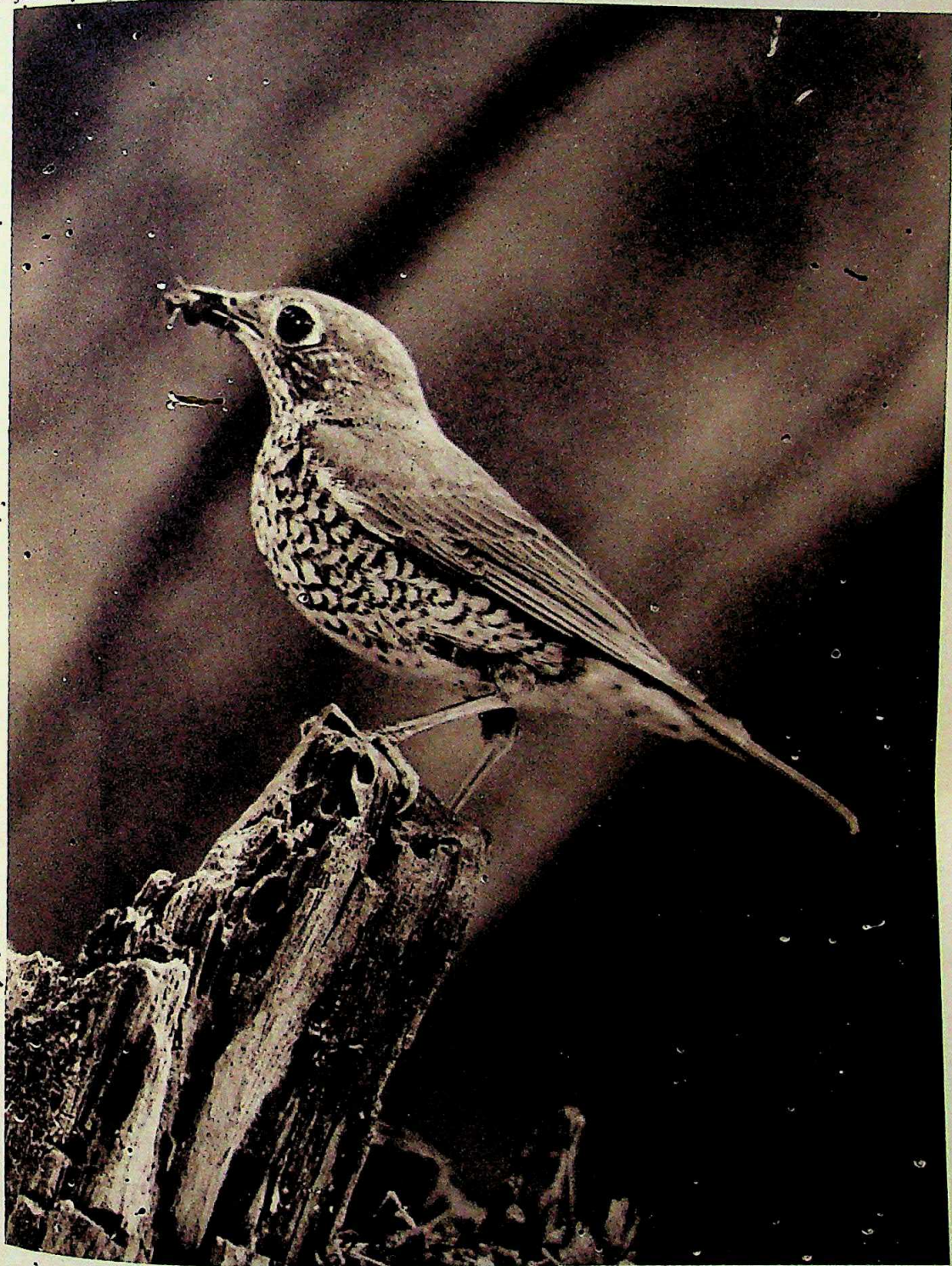
I was disappointed with my view of the bird at the nest. He squeezed in too close to the trunk with his back to the camera, so

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BLUE-HEADED ROCK-THRUSH (*Monticola cinclorhyncha*)

Comparatively common and extremely widespread, this beautiful bird is excessively cautious in its approach to the nest.



* BLUE-HEADED ROCK-THRUSH (*Monticola cinclorhynchos*)

So very soberly arrayed in comparison with her brightly dressed husband.

as soon as they had both gone I turned the lens on to the stump. Shortly afterwards the female returned, but to my complete disgust she flew straight to the nest and settled down looking directly at me. I don't suppose she could see anything but I had an awful feeling that she was looking straight through the peephole at my left eye. For half an hour I attempted to emulate the proverbial mouse. Fortunately a noisy individual with some cattle and goats came on the scene and off she went. Twenty minutes went by and then suddenly her image seemed to fill the whole focussing screen. There she was standing sideways on the stump eyeing the hide; in fact a glance at the illustration shows a tiny image of it in her pupil. Cautiously I pressed the release and gave an exposure of a good three seconds. She flew to the nest so I started to change the plate. At once she froze and I perforce did likewise, the result being that for perhaps 10 minutes, which seemed more like an hour, we maintained the most uncomfortably strained attitudes; she with her head twisted sideways looking over her shoulder, and I trying to preserve a precarious balance with my hands full of plate-holders and my feet all over the place, as the camp stool had slipped on the steep hillside—their nests so often seem to be on steep hillsides!

A bird which I found extremely common throughout the lower parts of the Kazinag forests was the Rufous-tailed Flycatcher (*Alseonax ruficaudus*). One of the most unobtrusive of the whole family both as regards its colouration and its habits which are really somewhat chat-like, it would often escape notice were it not for the incessant complaining note 'Peup' which it utters incessantly when one is anywhere near its nest. I found we had a typical nest close to the Kiterdarji Forest Rest House, a rather large pad of moss plastered on to the upper side of a fork of a horizontal branch of a fir tree. It was about 15 feet from the ground and 7 feet out from the trunk. From directly below it was quite invisible but from either side it showed up clearly as a substantial compact excrescence, considerably larger and far less symmetrical and neat than that of the Sooty Flycatcher. There were three typically spotted young ones in it nearly ready to fly. I had no difficulty whatsoever in getting photographs from the hide placed on a platform laid across two very convenient horizontal branches sprouting from the opposite side of the trunk. I found the parents had varied notes for their arrival at the nest, sometimes uttering a soft 'chur' and sometimes a double 'te-peup', the danger note preceded by a short 'te'.

Indian Red-Breasted Flycatchers (*Siphia parva hyperythra*) were common here. In other nullahs I had seen very few, one or two near the Naugam F.R.H. but none at elevations above 7,000 ft. Their breasts were such a deep brick-red that in order to make certain of the race I'm afraid I succumbed to shooting one pair which had still got eggs in a Woodpeckers' disused boring. I also saw more Green-backed Tits (*Parus monticolus*) in the Kazinag than I have seen elsewhere in Kashmir. They seem to be very much of a forest bird whereas the Grey-backed Tit is more a bird of the orchards, willow groves, and hedge rows.

Most of these little valleys had a pair or two of Kashmir

Rollers (*Coracias garrula semenovi*). One pair were always visiting the Rest House not far from which they caught frogs and large grasshoppers and flew off with their prizes to somewhere beyond the village, about half a mile away. Eventually I found they had three small young ones and an addled egg in a large cavity in a tall willow tree just beyond it. We managed to build up a platform for the hide on the very summit of an adjacent apple tree.

They were bold birds but not half so noisy and acrobatic as their more brightly plumaged cousins of the plains. There were two holes above the nest one of which was very small while a third one, lower down and the largest, directly faced the camera. It soon became evident that the birds had a fixed routine, entering by the larger of the top holes and coming out through the one in front of me. This arrangement did not suit at all as I got a tailend view each time a bird entered and they left without pausing on the rim of the large hole.

After a few attempts I had their normal entry hole stuffed up with a coolie's puggri. The result was quite ludicrous. One of them arrived with a large frog in its beak. For more than ten minutes it alternated between standing forlornly on the puggri and trying vainly to force its shoulders through the small hole near it. Eventually it swallowed the frog and flew away. It seemed quite incapable of appreciating the fact that it could get in through the hole by which it usually came out. At last the other bird appeared. At first it seemed just as much at sea as its mate but all at once light dawned upon it with such celerity that it popped in without giving me time to press the release. Shortly afterwards the male again arrived with a frog, going through the same performance as before except that he flew off to their favourite perch still with the food in his bill. This was doubly unfortunate as they seemed to feed the young ones in strict rotation so that the female promptly refused to come near until she thought he had done his bit. He wasted twenty minutes in flying backwards and forwards before he guiltily scooped the frog himself whereupon the wife at once condescended to come once more. This time I was the one at fault: she stood so still across the top of the hole that I could not resist taking her portrait with the result that when she suddenly flew down and clutched its bottom rim with her tail spread out across the bark in the very attitude I had visualised, I was in the act of changing the plate. Thereupon feeling that all three of us were being equally futile I went home in disgust to pack up in readiness for the next day's march to Baramullah.

JOURN. BOMBAY NAT. HIST. SOC.



INDIAN RED-BREASTED FLYCATCHER (*Siphia parva hyperythra*)

The entire underparts appeared a deep brick red as the male left the nest-hole, while the female was only slightly less bright and lacked the dark stripes down the sides of the neck.

THE SLENDER LORIS OF THE HORTON PLAINS, CEYLON.

Loris tardigradus nycticeboides, subsp. nov.

BY

W. C. OSMAN HILL, M.D., F.L.S., F.Z.S., ETC.

(With plates)

The recent demise of a pair of Slender Lorises obtained originally in May 1938, by Mr. A. C. Tutein-Nolthenius from the Horton Plains, (altitude 6,000 feet) in central Ceylon, enables me to supply a descriptive account of them under a new subspecific name. That the animal is rare in that locality is evidenced by the fact that Mr. Tutein-Nolthenius had been on the look out for it for the previous twenty years without success. The pair was forwarded to Colombo immediately and kept in captivity by Dr. L. Nicholls until August 1940, when they were transferred to my own collection. During their sojourn with Dr. Nicholls the female gave birth to two young, one in December 1938 and another in May 1940. An account of the earlier pregnancy and gestation period has already been published by Nicholls (1939). Both young died, the first, a male, at the age of one year and the second, also a male, whilst still an infant. Both have been used in compiling the present contribution. A week after the two adults were deposited with me the female collapsed suddenly and died. A half-term gestation sac was discovered in her vagina. The male died of hepatic disease about a week later. The skins and skeletons of both were preserved.

When first received in 1938 these Lorises were noticed to be remarkably fine animals, large in size and with exceptionally heavy pelage, which, with the apparent relative shortness and stoutness of the limbs, especially the hind pair, gave to them the aspect of small Slow Lorises (*Nycticebus*) Nicholls (loc. cit.) had referred to them as extreme types of *Loris tardigradus grandis*, Hill and Phillips (1932), the form recorded hitherto only from altitudes of about 3000-3500 feet, but it was clear on further examination that if *L. t. grandis* was worthy of subspecific status, then these Horton Plains examples were very much more deserving of separate treatment. Typical *grandis* is intermediate between the present animal and the common lowland animal *L. t. tardigradus*, but at present there is a wide altitudinal hiatus between 3500 and 6000 feet from which no specimen has yet been obtained. Meantime it is considered best to treat the Horton Plains examples as a new sub-species for which the name *nycticeboides* is proposed, in allusion to the resemblance to the Slow Loris referred to above.

Loris tardigradus nycticeoides, subsp. nov.

Type. ad. ♀ from Horton Plains, circa 6000 feet, Central Ceylon.

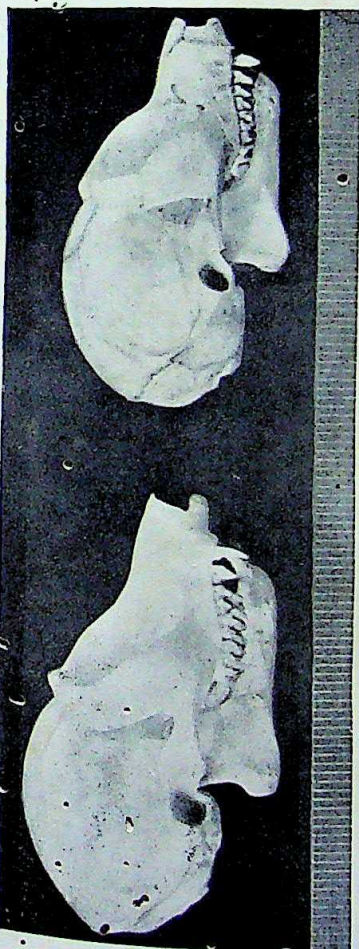
1. MEASUREMENTS.

TABLE I. General Bodily Measurements of *Loris tardigradus nycticeoides*

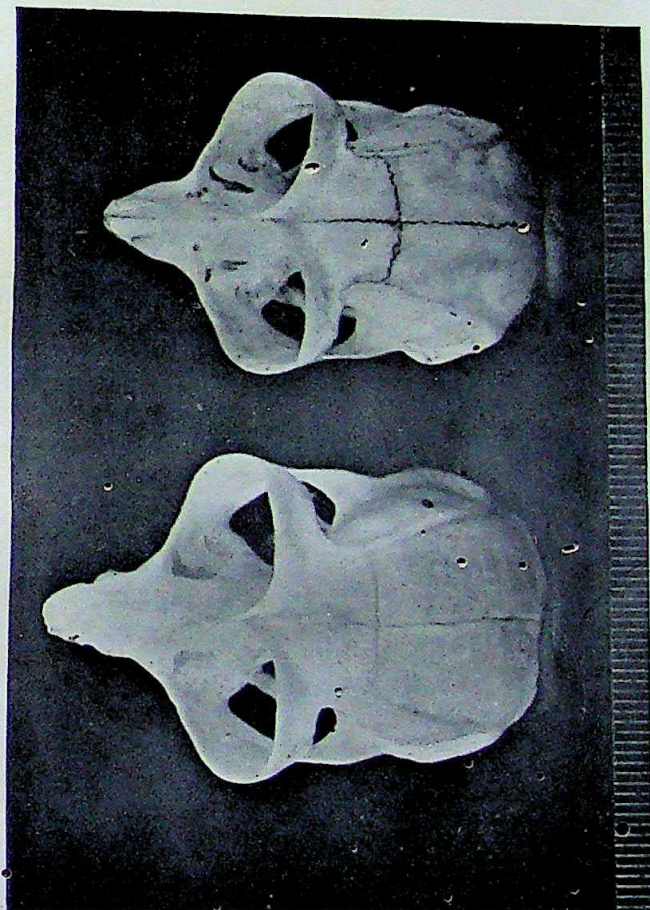
	♀ ad. Type	♂ ad. (para-type)	♂ 1 year old	♂ infant
Body weight	190 gm.	140 gm.	199	93
Length of head and body	213	204	199	40
Length of head	57	52	53.5	14
Length of ear	26	25	23	22
Bimalar breadth	33.5	32	35.5	10.5
Nasion-rhinion	19	17	15	8.5
Width of palpebral fissure	16	14	15	...
Height of palpebral opening	12	10	11	25
Bisacromial breadth	55	38	44	26
Length of brachium	69	59	45.5	35
Length of antebrachium	70	66	62	17
Length of hand	27.5	33	31	16.5
Bitrochanteric breadth	38	33	35	34
Length of thigh	66	63	50	37
Length of crus	67	66	63	29
Length of foot	47	47	46	6.5
Length of phallus	10	11	16.5	...

TABLE II. Measurements of Digits of *L. t. nycticeoides*

Measurement	♀ ad. (Type)	♂ ad. (para-type)	♂ 1 year old	♂ infant
Radial styloid to tip of pollex	mm. 17	mm. 13	mm. 13	mm. 10
L. of index	6	10	10.5	8.5
L. of medius	11.5	13	14	10.5
L. of annularies	11	14.5	14.5	12
L. of minimus	10	11.5	12.5	9.5
L. of hallux	20	22.5	21	13
L. of second toe	6	6	15	4.5
L. of claw on above	6.25	6	4	4.5
L. of third toe	13	15.5	14	7
L. of fourth toe	15	18.5	17.5	9.5
L. of fifth toe	14	17	16	8



1. Skulls of *Loris tardigradus nycticeboides* (left) and *L. t. tardigradus* (right) in *norma lateralis*.



2. Skulls of *Loris tardigradus nycticeboides* (left) and *L. t. tardigradus* (right) in *norma verticalis*.



Loris tardigradus nycticeboides subsp. nov. (Type ad. ♀). Horton Plains, circa 6000', Central Ceylon.

THE SLENDER LORIS OF HORTON PLAINS, CEYLON

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TABLE III. Limb-Indices of Lorises*

Index	<i>L. t. nycticeboides</i> ♀ ad. (type)	<i>L. t. nycticeboides</i> ♂ ad. (paratype)	<i>L. t. nycticeboides</i> ♂ 1 yr. old	<i>L. t. nycticeboides</i> ♂ infant	<i>L. t. grandis</i> ♀ type	<i>L. t. grandis</i> av. of 2 ad. ♂♂	<i>L. t. tardigradus</i> av. of 4 ads.
Fore-limb—trunk index	83.5	82	74	115	84	88	93.5
Hind-limb—trunk index	85.5	85	78	134	95	96	107.5
Intermembral index	98	97	95	86	88	92	86
Humero-radial index	116.5	112	136	134	114	117	145
Femoro-tibial index	102	105	126	109	110	105	106

* Hand and foot have been excluded in calculating the limb indices.

The following inferences may be drawn from a perusal of the preceding tables. In the Horton Plains Loris the limbs are relatively shorter in reference to the trunk than in any of the other races dealt with. The hind limb is especially shortened. These differences are not noted in the new-born individual, which retains the proportions noted in the other races. The lowland animal differs most from *nycticeboides*, *grandis* being intermediate. The intermembral indices elicit similar deductions; but the humero-radial and femoro-tibial indices present no significant differences among the forms studied.

II. PELAGE.

(a) Type ♀.

The fur is very long, soft and thick causing the animal to look much larger than its actual bodily measurements would suggest. This is particularly true of the limbs, which are thickly furred towards their extremities, especially the hind pair. Hairs on upper back measure up to 25 mm. long, and on ventral surface up to 30 mm.

General colour of upper surface brown, with no reddish tinge, slightly darker on crown, nape and upper back, much paler on lower back and hind limbs. Bases of hairs plumbeous grey followed by buffish zone, and finally with brown. Some of the longer hairs on shoulders and upper back are tipped with buff, but there is no white frosting anywhere. Ventral surface from chin to upper abdomen buff. Belly more ochraceous. Hairs grey at the base, except on a collar across the lower throat, where the long hairs are light buff throughout. Anterior to this the bases of the hairs are pale grey and the tips light buff (cf. the white throat of *L. t. grandis*). Posterior to the collar the bases of the hairs very suddenly assume a dark grey tinge, which gradually darkens posteriorly.

Interocular white stripe narrow, enlarged on forehead and continued round very dark, almost black circumocular areas. Hairs on cheeks tipped with white. Eyelashes well developed, long and black. Muzzle with a few short dark brown hairs. Ears densely

clothed with greyish-brown fur. Arms paler than back, especially on flexor aspect and towards distal end. Hand clothed with short, sparse white hairs, except on distal phalanges. Hind limbs similar to lower back, but a little paler distally and on flexor surface. Foot more heavily clothed with white fur than hand, with sharp line of demarcation at ankle.

(b) *Adult male.*

Similar to the female, but smaller and slightly darker in colour; the dark brown of the upper back extending farther backwards, and the basal grey zone of the dorsal hairs being of a darker tint. Ventral aspect similar to the female, but all the hairs of the throat are uniformly buff. Face, ears and limbs as in female.

(c) *Infant male.*

Dorsal surface dark grey with a slight surface wash of brown, paler on limbs especially flexor aspects and more distal parts. Ventral surface including throat dirty white. Circumocular areas chestnut, surrounded above and laterally by a zone of white-tipped dark grey hairs. White tips most marked in preauricular region. Muzzle whitish. Ears more scantily haired with long dark grey hairs than in adult. Hands and feet also less heavily furred.

III. SKIN PIGMENTATION.

Naked part of rhinarium pink, but hairy part of muzzle has a little dusky pigment. Eyelid margins and margin of nictitating membrane deeply pigmented, the pigment sometimes extending a little way on to the conjunctival surface. Rest of conjunctiva unpigmented. Ears pigmented a little towards their free margins. Lips, hands and feet show no appreciable pigment in the adults, but the dorsum of the hand and foot are somewhat dusky in the infant, the edge of the pigmented area being sharply defined from the pallid surface of the palm and sole. Honeycomb pigmentation of scrotum of rutting male very slight and confined to the posterior aspect of the sac.

IV. SKULL.

Although the somatic measurements indicate that the present race of *Loris* is no larger than specimens of *L. t. grandis*, despite its apparently greater bulk during life, the above table shows that the skull is definitely greater than in *grandis* in many of its dimensions. The cranium is appreciably longer, but narrower than in *grandis* or *tardigradus*. The breadth across the bullae, however, is greater than in either of the preceding forms. The palate is shorter, but wider, and the mandible slightly smaller accordingly. The osseous snout is somewhat more prominent than in the other races, and this is associated with considerably larger anterior palatine canals. Ethmo-maxillary fossae, which have been previously (1933) shown to differ among the different races of *Loris*, are here equally distinct, being relatively larger than in any of the previously known forms and almost oval in shape. The thin flange of bone forming

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TABLE IV. Cranial measurements of *Loris tardigradus nycticeboides*.

Measurements	<i>L. t. nycticeboides</i> Type ♀	<i>L. t. nycticeboides</i> Para-type ♂	<i>L. t. grandis</i> av. of 3	<i>L. t. tardigradus</i> av. of 7
Maximum cranial length	mm 52.5	mm 54	mm 51.9	mm 48.6
Maximum cranial breadth	26	26	29.25	30.3
Skull height	22	21	...	...
Minimum cranial breadth behind orbits	18	...	16.6	17
Least frontal breadth	14	15	...	...
Breadth across bullae	30	30	29	27.8
L. of foramen magnum	6.25	...	...	...
Br. of foramen magnum	6.5	...	...	...
Palatal length	18	...	19.3	17.5
Breadth across m 3	16	17.5	15	14.7
Upper tooth row	16	16	16.8	15.3
Bizygomatic breadth	32.5	32	...	...
Interorbital breadth	1.25	1.5	...	...
Condylion-symphysion	26	27	28	27
Mandibular ht. (at condyle)	11	10	...	...
Mandibular ht. (at coronoid)	17	...	...	...
Lower tooth row	13	12	15.6	14.8

the lateral boundary of this fossa in the floor of the orbit is extremely attenuated and quite transparent giving a free view into the maxillary antrum. The temporal ridges are very prominent, approaching within 14 mm. of one another on the frontal bone and then receding gradually until they are 25 mm. apart where they join up with the lambdoid crest. In the mid line of the squamous portion of the occipital bone the external occipital crest, after an initial 2 mm. swells up to form a sugar-loaf-shaped vertical torus, the base of which extends down to the foramen magnum and fills up the whole of the space between the two occipital condyles. This torus is present in the other races, but in a much reduced form compared with its appearance in *L. t. nycticeboides*.

SUMMARY.

A new race of Slender Loris superficially resembling a Slow Loris is described from the Horton Plains, (alt. 6000 feet) in Central Ceylon. The description is based on an adult pair and two of their offspring.

The race is nearest in most characters to the previously known *L. t. grandis*, but differs in its appendical proportions and in coat characters. Although not exceeding *grandis* in its general bodily size, the new race has a larger head, and shorter limbs, the hind pair being especially affected. The coat is exceedingly thick and long and clothes the limbs more fully than even in *grandis*. It differs in colour from *grandis*, approaching nearer to *tardigradus* in this respect, though lacking any erythristic tendency.

In conclusion I have to tender my warmest thanks to Dr. L. Nicholls for having handed over to me the material, both living and preserved, upon which the above account is based.

REFERENCES TO LITERATURE.

- Hill, W. C. O. 1933, *Ceylon J. of Sc.*, xviii, pp. 89-132.
Hill, W. C. O. and Phillips W. W. A. 1932 *Ceylon J. of Sc.* xvii pp. 109-122.
Nicholls, L., 1939 *Nature*, cxliii, p. 246.

EXPLANATION OF PLATE.

- Fig. 1.—Photograph of the prepared skin of the type female of *Loris tardigradus nycticeboides*, subsp. nov.
Fig. 2.—Photographs of the skulls of (a) *Loris tardigradus nycticeboides*, adult female, (b) *L.t. tardigradus*, adult female. Upper figure in norma lateralis, lower in norma verticalis.

FISH OF POONA.

BY

CAPT. A. G. L. FRASER, I.M.D.

PART I.

*General Account and Descriptions of Localities with Lists of
Fishes Collected from each.*

INTRODUCTION.

At the request of Mr. S. H. Prater, Curator, Bombay Natural History Society, and Dr. S. L. Hora of the Zoological Survey of India, I undertook to get together a collection of fishes from the Poona waterways. Mr. Prater very kindly obtained for me the necessary permits to fish in the lakes in the area.

The collection was begun on 15th September 1936 and continued over a period of eight months. Weekly excursions were made, generally on Sundays, and various points of the Mutha-Mula river, as also lakes Fife and Pashan, the tanks at Katraj, and the right bank canal were visited. Altogether 34 batches, collected from 19 localities which in the count total 2851 specimens of various species were secured. As regards the number of species, it would appear that local fishermen recognize 143 different species. This number I consider is greatly exaggerated. In the collection, however, according to the vernacular names given by a fisherman, there are 117 species. This number is subject to investigation and correction by Dr. Hora¹.

It is much regretted that I was unable to visit the outlying lakes, namely Mulshi and Whiting, and the river Indrayani. The collection I think represents in a fair way the fish fauna present in the Poona district waterways as a whole. The Indrayani being a tributary of the Mutha-Mula river, it can be assumed that the fish in it are also fairly represented in the collection made.

The fishes obtained from the lakes are hardly representative, in that only a few species were secured, and there are no examples of the larger carps and game fishes. The reason for this is because the great depths of the water in the lakes rendered impracticable the use of the bell-shaped casting net ordinarily used by fishermen, and by this means only small fry were obtained from the shallow parts near the beach. Trolling all day in a boat with rod and line and using all kinds of artificial, live and other, baits, including a range of bright and dull spoons, drew blanks at three separate

¹ Dr. Hora and Mr. Misra have identified 53 species in the entire collection which was sent to the Zoological Survey of India for determination. I am indebted to them for their kindness in this matter. A systematic list of the species will be published in the second part of this series of articles.

visits to Lake Fife and two to Pashan. In the experiences here with rod and line I found that the river Mutha-Mula, especially in the stretch above the Bund Garden, and around Kirkee near Holkar bridge and at the junction of the two rivers Mutha and Mulla, locally known as the Sangam, offers better scope in the way of sport to the angler than the lakes. The game fishes in the river readily take baits of any kind, particularly if trolled from a boat between the bank and midstream. This I think is because there are no restrictions to fishing, except in a few reserved sections, and fish are angled for with rod and line by numerous enthusiasts who bait their pitches and line the banks everywhere. On the other hand fishing in the lakes is prohibited except to a privileged few. It is a singular fact that the big game fishes cannot normally be netted by fishermen midstream in the river Mutha-Mula, where only small fry can be taken. The larger carps can be netted and hooked during the day between the bank and midstream. As regards the lakes, I have seen huge carps in the middle of the lake leaping out of the water particularly during the early morning and late in the evening.

GENERAL ACCOUNT.

The Mutha-Mula river is by far the largest and broadest river in the Poona district area. A singular feature noted is that the tributary *nallqhs* which I encountered here are dry. In the Deolali area perennial streams fed by springs are more the rule than an exception. The Mutha river begins in the hilly region above and around lake Fife, which has been created by the damming of its waters by masonry constructions resulting in the formation of a huge catchment area about 10 miles long and on an average $\frac{1}{2}$ mile broad. The river continues its course from below the dam, but as the larger volume of water is released into the right and left bank canals, comparatively very little water passes through the river bed itself. The lake is eleven miles by road from Poona. It lies at an altitude of roughly 2,000 feet above sea level. The Mula river is fed by the waters from lake Mulshi which lies at an altitude of 1,900 feet above sea level, and it is 40 miles distant from Poona. Both these rivers descend to a level of 1800 feet at their junction near to Wellesly bridge. This junction is known as the Sangam. The Mula is a broader and deeper river than the Mutha and in the section around Kirkee and Holkar bridge there is undoubted evidence of the presence of some very large members of the carp family. The broadest and deepest section of the combined rivers is from the Sangam to the bund near Fitzgerald bridge. This stretch is roughly 2 miles long and $\frac{1}{4}$ mile broad and runs in a slightly north-easterly direction. In it a variety of fish fauna exists. The banks average 15 to 20 feet above the water level and the average depth of the water must be at least 15 feet. The south bank is heavily wooded throughout except in a few certain sections. The north bank is sparsely wooded in parts and for the greater part is bare of vegetation. The south bank is partly rocky, but the greater lengths of it are earthy. On the other hand the north bank is practically rocky throughout and partly earthy only in certain sections. This accounts for the absence of vegetation on the one bank as

compared with the profuseness of it on the other. The flora consists of Babul principally, Tamarind, Mango, Pipal, Gold Mohur and a variety of other trees. The south bank is more covered with grass and rushes near the water's edge. During the monsoon (15th June to 15th September) the river rises, particularly at the end of June by at least 15 to 20 feet and in certain areas overflows over the south bank and inundates the adjoining lands. The volume and flow is then very considerable and the bund near the bund garden is completely covered, the water rising to a little over half the height of Fitzgerald bridge which is about 40 feet high. Usually at the end of the second week of July the river subsides, but the force and volume of water are still great and turbulent. The bund near the bund garden is now visible and there is a fall of about 2 feet into the seething waters below. At this time I have seen large fish gaining access to the reach above the bund by successfully leaping upstream over the fall. Fishing in the early phase of the monsoon is practically impossible, but when the waters have subsided about the end of July the fishermen are able to place nets in the area below the bund despite the turbulence of the water. This is because they have built up walls of stone up to the level of the bund and by this means are enabled to use their particular type of nets which are strongly made in the shape of elongated sacks with a mesh of $1\frac{1}{2}$ inches. One end is very wide, and the other narrows down to a point which is effectively sealed up with gunny sacking. The subsidence goes on, and by October the flow over the bund has greatly decreased and areas of the rocky base below it become visible. By December there is very little water falling from the bund, and by the middle of January this ceases except for a small rush of water near to the bund garden end where there is an outlet in the masonry construction which allows of this. The stretch for $3\frac{1}{2}$ miles below Fitzgerald bridge is rocky throughout with large basalt boulders some of which are 15 feet high. The main river bed proper is as wide as the reach above the bund, and during the rains is completely covered with raging storm waters, but in the dry weather the rocky nature of the bed is exposed and this is interspersed with earthy patches which are grass grown and in parts are rank with rush and other aquatic plants. The banks proper are identical in their features as those described in the stretch above the bund, except that the south bank is less wooded and the trees here are all babul. The main presentation here is that during the dry season of the year there is a sluggish flow of water through narrow channels in the higher parts of the run. In the deeper sections large pools are created with an average expanse of 40 to 50 yards and a depth in the deepest parts of 4 feet. In the portions where there is a fall in the gradient the current is moderately strong, but generally in the months of February to May a stagnation of the water is evident. From December onward the whole of this area is choked with algae. During the latter end of April and May the whole of the river presents a peculiarity which is unique. Then the surface of the water, in parts of the upper reach above the bund as far as Kirkee is, completely covered by a floating aquatic plant, which presumably is a species of duck-weed, so profuse and rapid is its growth that at times the whole expanse is completely grown

over with it to the extent that it has to be cleared to allow of the working of ferry services and contractors rafts on which sand is carried from one bank to the other. The section below the bund is particularly rank with the weed and fishermen have to suspend operations during this time and are compelled to go down the river as far as Manjri and further afield to earn a living. In the pockets near the banks where this weed is held up it becomes a menace to the health of residents in the locality because of the facilities it affords to mosquitoes for breeding. Mosquito larvae, particularly Anopheline, were found in the collection of water in between its petals which form a rosette. Small wading birds are able to stand and walk about on it, especially in the heavy collection which gathers immediately above the bund.

The various batches of fishes were placed in serial order of the dates on which each was secured. The Hindi names of the many species were given to me by a 'Pardeshi Boie'. The Mahratti names have not been given, as in the naming of fishes there is a great variance and discrepancy existing amongst Mahratta fishermen. The 'Pardeshi Boies', as they call themselves, a great many of whom have been fishing in these waters for many generations, are more consistent and accurate in the Hindi names by which they differentiate the species. These local names are included in the list of species which will be published in the next part of this series of articles.

DESCRIPTIONS OF LOCALITIES WITH LISTS OF FISHES COLLECTED FROM EACH.

1. Below Fitzgerald bridge. 15-9-1936, 4-10-1936, 13-11-1936, 31-1-1937, 18-2-1937, 28-3-1937, and 10-4-1937.

* This section is rocky for the main part. The depth of the pool averages 4 feet, and it has a wide expanse of 50 to 60 yards. There is a fair volume of water rushing through with a moderately strong current midstream. The water is somewhat turbid.

i. <i>Notopterus notopterus</i> (Pallas)	...	14 specimens.
ii. <i>Anguilla bengalensis</i> (Gray)	...	1 specimen.
iii. <i>Chela hoopis</i> Day	...	22 specimens.
iv. <i>Chela clupeoides</i> (Bl.)	...	77 specimens.
v. <i>Chela phulo</i> (Ham.)	...	225 specimens.
vi. <i>Danio aequipinnatus</i> McClell.	...	1 specimen.
vii. <i>Rasbora daniconius</i> (Ham.)	...	2 specimens.
viii. <i>Barbus (Puntius) chola</i> (Ham.)	...	4 specimens.
ix. <i>Barbus (Puntius) Jerdoni</i> Day	...	13 specimens.
x. <i>Barbus (Puntius) kolus</i> Sykes	...	14 specimens.
xi. <i>Barbus (Puntius) sarana</i> (Ham.)	...	7 specimens.
xii. <i>Barbus (Puntius) licto</i> Ham.	...	1 specimen.
xiii. <i>Barbus (Tor) khudree</i> Sykes	...	14 specimens.
xiv. <i>Cirrhina fulungee</i> (Sykes)	...	5 specimens.
xv. <i>Garra mullya</i> (Sykes)	...	48 specimens.
xvi. <i>Labeo boggut</i> (Sykes)	...	5 specimens.
xvii. <i>Labeo potail</i> (Sykes)	...	16 specimens.
xviii. <i>Mystacoleucus ogilbii</i> (Sykes)	...	7 specimens.
xix. <i>Rohtee cotio</i> var. <i>cunna</i> Day	...	12 specimens.
xx. <i>Rohtee neilli</i> Day	...	2 specimens.
xxi. <i>Rohtee vigorsii</i> Sykes	...	19 specimens.
xxii. <i>Lepidocephalus guntea</i> (Ham.)	...	1 specimen.
xxiii. <i>Nemachilus botia</i> var. <i>aureus</i> Day	...	9 specimens.

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xxiv.	<i>Nemachilus dayi</i> Hora	...	7 specimens.
xxv.	<i>Callichrons bimaculatus</i> (Bl.)	...	2 specimens.
xxvi.	<i>Callichrons pabo</i> Ham.	...	3 specimens.
xxvii.	<i>Mystus cavasius</i> (Ham.)	...	12 specimens.
xxviii.	<i>Rita hastata</i> (Val.)	...	4 specimens.
xxix.	<i>Rita pavimentata</i> (Val.)	...	4 specimens.
xxx.	<i>Gagata itchkeea</i> (Sykes)	...	9 specimens.
xxxi.	<i>Glyptothorax lonah</i> (Sykes)	...	2 specimens.
xxxii.	<i>Proeutropichthys taakree</i> (Sykes)	...	1 specimen.
xxxiii.	<i>Silonopangasius childrenii</i> (Sykes)	...	4 specimens.
xxxiv.	<i>Xenentodon cancila</i> (Ham.)	...	7 specimens.
xxxv.	<i>Ophicephalus marulius</i> Ham.	...	2 specimens.
xxxvi.	<i>Ambassis rangq</i> (Ham.)	...	12 specimens.
xxxvii.	<i>Glossogobius giuris</i> (Ham.)	...	13 specimens.

2. About one mile east of Fitzgerald bridge. 20-9-1936.

There is a rocky bed in this stretch which is about 80 yards wide and some 100 yards long. The average depth of the water is 4 to 5 feet and the current is more in the nature of a surface flow than one of a rushing current either centralised in midstream or against one of the banks. There are several islands which consist of basalt boulders standing up out of the water to a height of 15 to 20 feet.

i.	<i>Barbus (Puntius) Jerdoni</i> Day	...	2 specimens.
ii.	<i>Barbus (Puntius) kolus</i> Sykes	...	1 specimen.
iii.	<i>Cirrhhina fulungee</i> (Sykes)	...	2 specimens.
iv.	<i>Crossochilus latius</i> (Ham.)	...	2 specimens.
v.	<i>Labeo fimbriata</i> (Bl.)	...	2 specimens.
vi.	<i>Labeo potail</i> (Sykes)	...	3 specimens.

3. Stretch about 2 miles east of Fitzgerald bridge. 29-11-1936.

The stretch is an extensive pocket about 40 by 50 yards connected with the main channel of the river. A section of the ground here is deeper than the bed adjoining and a collection of water in it has become landlocked. The average depth is 3 feet in the middle of it and in the shallows about 1 foot. It is partly rocky and silted up. In the silted sections algae are present and some weeds. There is no current. The water is dirty-looking with a scum on the surface.

i.	<i>Notopterus notopterus</i> (Pallas)	...	42 specimens.
ii.	<i>Mastacembelus armatus</i> (Lacép.)	...	7 specimens.
iii.	<i>Barbus (Puntius) chola</i> (Ham.)	...	3 specimens.
iv.	<i>Barbus (Puntius) ticto</i> Ham.	...	9 specimens.
v.	<i>Garra mullya</i> (Sykes)	...	1 specimen.
vi.	<i>Nemachilus botia</i> var. <i>aureus</i> Day	...	4 specimens.
vii.	<i>Nemachilus dayi</i> Hora	...	16 specimens.
viii.	<i>Mystus cavasius</i> (Ham.)	...	2 specimens.
ix.	<i>Ambassis ranga</i> (Ham.)	...	8 specimens.

4. A rocky pool, 3 miles east of Fitzgerald bridge. 6-12-1936, and 28-5-1937.

The pool is situated in a boulder strewn stretch and is nearly in the form of a square. It is practically all rock and so is its bed. There is a centrally running current of moderate intensity. Green algae are present in some portions of the pool where the current is weak, especially in its angles. The depth varies from 2 feet to over 6 feet centrally.

i.	<i>Notopterus notopterus</i> (Pallas)	...	8 specimens.
ii.	<i>Chela phulo</i> Ham.	...	1 specimen.
iii.	<i>Barilius barna</i> Ham.	...	1 specimen.
iv.	<i>Barbus (Puntius) Jerdoni</i> Day	...	3 specimens.

v.	<i>Barbus (Puntius) kolus</i> Sykes	...	1 specimen.
vi.	<i>Barbus (Puntius) sarana</i> (Ham.)	...	4 specimens.
vii.	<i>Barbus (Puntius) ticto</i> Ham.	...	5 specimens.
viii.	<i>Barbus (Tor) khudree</i> Sykes	...	5 specimens.
ix.	<i>Cirrhina fulungee</i> (Sykes)	...	1 specimen.
x.	<i>Garra mullya</i> (Sykes)	...	7 specimens.
xi.	<i>Labeo potail</i> (Sykes)	...	3 specimens.
xii.	<i>Mystus cavasius</i> (Ham.)	...	2 specimens.

5. A run about 3 miles below lake Fife. 20-12-1936.

This particular reach of the river is a broad expanse of water about 700 yards long and 80 yards broad. Here apparently the river has collected in a deep depression in the surface of the land, because above and below the section the river flows in very narrow channels barely 8 yards broad. The average depth midstream must be over 6 feet as the depth near the banks are 4 feet. The banks are roughly 3 feet above the water level. The direction of the river is due north-east and the banks lie roughly west and east. On the west bank and flanking it is a hill on which Babul, Tea, Tamarind and Mango flourish. The east bank is similarly wooded and the adjacent land is undulating. The banks are earthy here and so is the bed of the river, and the edges are grown with weeds and underwater vegetation. The river bed above and below the reach under reference is covered with small boulders and coarse sand. There is a moderate current which hugs the west bank and here the bed is silted. It was difficult working with a net on account of the weeds.

i.	<i>Danio aequipinnatus</i> (McClell.)	...	4 specimens.
ii.	<i>Rasbora daniconius</i> (Ham.)	...	5 specimens.
iii.	<i>Barbus (Puntius) kolus</i> Sykes	...	3 specimens.
iv.	<i>Barbus (Tor) khudree</i> Sykes	...	1 specimen.
v.	<i>Crossochilus latius</i> (Ham.)	...	2 specimens.
vi.	<i>Labeo calbasu</i> (Ham.)	...	5 specimens.
vii.	<i>Labeo potail</i> (Sykes)	...	1 specimen.
viii.	<i>Rohdea rigorsii</i> (Sykes)	...	2 specimens.
ix.	<i>Nemachilus dayi</i> Hora	...	2 specimens.
x.	<i>Ambassis ranga</i> (Ham.)	...	2 specimens.

6. Lake Fife (Kharkwasla). 20-12-1936.

The fishes were caught on the east beach which is shingle and rock, and they were taken near the dam which is about 35 feet high. There is a current created here due to the flow of water through the sluices into the right bank canal. The bank slopes to the water's edge and for a yard length is about a foot in depth. It then deepens suddenly to 5 feet and thereafter it must be very deep. I do not know the exact depth of the lake in its deepest portions, but in casting a net from the boat and letting out the drag rope to the fullest extent the weighted end of the net did not touch bottom. Towards the Boat Club enclosure the water does not deepen suddenly. The maximum level of the water as shown on the map is during September 1911 feet and the minimum 1883 feet in June. The lake is fed by the Mutha and Mose rivers and the greater volume of its water is diverted into the right and left bank canals. The left bank canal ends near Kirkee.

i.	<i>Chela boopis</i> Day	...	2 specimens.
ii.	<i>Danio aequipinnatus</i> (McClell.)	...	4 specimens.
iii.	<i>Barbus (Puntius) kolus</i> Sykes	...	1 specimen.
iv.	<i>Barbus (Puntius) sarana</i> (Ham.)	...	1 specimen.
v.	<i>Barbus (Tor) khudree</i> Sykes	...	1 specimen.
vi.	<i>Cirrhina fulungee</i> (Sykes)	...	1 specimen.
vii.	<i>Garra mullya</i> (Sykes)	...	3 specimens.
viii.	<i>Glossogobius giuris</i> (Ham.)	...	18 specimens.

7. The stretch of the Mutha-Mula river near the Infectious Hospital, Poona. 24-12-1936.

At the time of the visit this section was covered with a green scum of algae, and there was no surface flow or evidence of any current. The stretch

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is about 40 yards wide and 400 yards long. In actual fact the continuity of the river here is divided into two streams by a large island. The stretch under reference is the one which runs by the island on its eastern side as the direction of the river is north-east. The island is large and is as long as the run itself and as broad. It is grown with Babul, Mango, Tamarind and Pipal trees, and is cultivated. The average depth of the run must be at least 4 feet. Near the banks it is 1-2 feet and is mostly earthy composed of an earthy bed covered with silt. In parts of the bed there is evidence of some rock. The bank on the hospital side is heavily wooded with Babul.

i. <i>Notopterus notopterus</i> (Pallas)	... 2 specimens.
ii. <i>Barbus (Puntius) Jerdoni</i> Day	... 1 specimen.
iii. <i>Barbus (Puntius) ticto</i> Ham.	... 100 specimens.
iv. <i>Barbus (Tor) khudree</i> Sykes	... 17 specimens.
v. <i>Garra mullya</i> (Sykes)	... 67 specimens.
vi. <i>Nemachilus dayi</i> Hora	... 19 specimens.
vii. <i>Mystus cavasius</i> (Ham.)	... 36 specimens.
viii. <i>Rita pavementata</i> (Val.)	... 1 specimen.

8. Mutha-Mula river near Kharadigaon village. 27-12-1936, 16-1-1937 and 10-6-1937.

The river in this section is a long run of a mile or more flowing due east. The north bank is rocky, and the force of the current which is moderately strong is directed against the north bank. There is no vegetation on this side. The south bank is a shingled beach, and nearer the water's edge is pebbled. The bed of the river is rock partly, and the greater portion is pebbled. The depth in its deepest parts nearer the north bank must be over 6 feet. It is more shallow—about 2 feet—near the south bank. The width of the expanse is roughly 90 yards across. The south bank is wooded with Babul. On the last visit (10-6-1937) the volume of water in this section had greatly decreased, and the current was very sluggish. The width of the run is now about 50 yards, and there is a large amount of algae at the sides of the river. The beach, from which the water has receded, is now dry and shows a large amount of silt admixed with sand in which are numerous empty shells of univalve and bivalve molluscs.

i. <i>Notopterus notopterus</i> (Pallas)	... 2 specimens.
ii. <i>Chela clupeoides</i> (Bl.)	... 38 specimens.
iii. <i>Danio aequipinnatus</i> (McClell.)	... 5 specimens.
iv. <i>Rasbora daniconius</i> (Ham.)	... 9 specimens.
v. <i>Barbus (Puntius) amphibius</i> (C.V.)	... 5 specimens.
vi. <i>Barbus (Puntius) kolus</i> Sykes	... 1 specimen.
vii. <i>Barbus (Puntius) sarana</i> (Ham.)	... 1 specimen.
viii. <i>Barbus (Puntius) ticto</i> Ham.	... 9 specimens.
ix. <i>Barbus (Tor) khudree</i> Sykes	... 4 specimens.
x. <i>Cirrhinia fulunjee</i> (Sykes)	... 4 specimens.
xi. <i>Garra mullya</i> (Sykes)	... 15 specimens.
xii. <i>Labeo potail</i> (Sykes)	... 5 specimens.
xiii. <i>Rohtee cotio</i> var. <i>cunna</i> Day	... 2 specimens.
xiv. <i>Rohtee vigorsii</i> Sykes	... 7 specimens.
xv. <i>Schizothoracichthys</i> (Nukta) nukta (Sykes)	... 1 specimen.
xvi. <i>Callichrons pabo</i> Ham.	... 1 specimen.
xvii. <i>Rita pavementata</i> (Val.)	... 1 specimen.
xviii. <i>Glyptothorax conirostre</i> var. <i>poonaensis</i> Hora	... 1 specimen.
xix. <i>Ophicephalus marulius</i> Ham.	... 3 specimens.
xx. <i>Glossogobius giuris</i> (Ham.)	... 3 specimens.

9. Lake Pashan. 3-1-1937.

Lake Pashan is shaped like the segment of a circle, roughly half a mile long and a quarter of a mile broad, and is really a catchment in which mostly rain drainage during the monsoon collects. There are a few narrow streams, more in the nature of rivulets and fed by springs, draining into the

lake on its western side. Lake Pashan is the water supply for Government House at Ganeshkind. There is a filtration plant and reservoir on the side near the bund portion on its northern face. The bund is an earthy bank which has been built upon with stone masonry and extends for about 400 yards. Part of the southern boundary of the lake consists of a dam about 10 feet above the water's surface and about 100 yards long. The rest of the bank is earthy on a rocky base except in parts where it is altogether earthy, and a fringe of about 300 yards on the southern side and another similar length on its western aspect are rankly grown with under-water weeds. The bed of the lake is in the greater part rocky and sanded. The western side is fairly well wooded with Mango and Babul, and where the streams join the lake it is marshy and grown with weeds and rushes. The banks here are turfed. In the marshy section there are numbers of aquatic birds of various kinds including duck. It was from this portion that most of the fishes were secured. The small streams—three in number—mentioned above had no fishes in them. This may be due to the presence of aquatic birds in the locality. The streams are about 100 yards in extent and run down from hillocks which are about 100 feet above the level of the lake, and their sources had no pools but the water oozed through rocky strata in the hill-side. Owing to the great depths in parts of the lake which has an average depth of 18 feet, it was impracticable to use a net, and although I was given the use of a boat and made every effort to have the bell-shaped casting net thrown over and over again in the middle of the lake, the results were very poor indeed.

i. <i>Notopterus notopterus</i> (Pallas)	... 1 specimen.
ii. <i>Chela boopis</i> Day	... 30 specimens.
iii. <i>Danio aequipinnatus</i> (McClell.)	... 38 specimens.
iv. <i>Rasbora daniconius</i> (Ham.)	... 73 specimens.
v. <i>Barbus (Puntius) amphibius</i> (C.V.)	... 4 specimens.
vi. <i>Barbus (Puntius) kolus</i> Sykes	... 1 specimen.
vii. <i>Barbus (Puntius) ticto</i> Ham.	... 40 specimens.
viii. <i>Cirrhitina fulungee</i> Sykes	... 37 specimens.
ix. <i>Crossochilus latius</i> (Ham.)	... 2 specimens.
x. <i>Garra mullya</i> (Sykes)	... 1 specimen.
xi. <i>Nemachilus botia</i> var. <i>aureus</i> Day	... 3 specimens.
xii. <i>Nemachilus dayi</i> Hora	... 1 specimen.

10. Mula river near the Ice Factory, Kirkee. 24-1-1937.

On the main road to Kirkee after leaving Government House on the left of the Railway line and half way between it and Kirkee there is an ice factory, located on the west bank of the Mula river. The stretch explored here is a broad expanse roughly 150 yards in width. A ferry service works here, and numerous contractor's rafts ply between the banks carrying sand. The direction of the flow is from north to south and the banks therefore lie east and west respectively. The east bank is sparsely grown with trees and other vegetation, and there are a number of workmen engaged in digging operations removing sand from the small hillocks on it. The west bank is more wooded and the part near the water's edge is well turfed. The east bank has a beach of coarse sand and more inland are the sandy hillocks which rise to about 30 feet above the water's surface. The west bank is 10 to 15 feet above the water and the ground here is earthy. There is a strong central current, and midstream the depth must be at least 12 feet while near the water's edge it is 3-4 feet. The bed near the bank is sanded and silted in parts. Nearly all of the larger fishes in this batch were caught between the bank and midstream. The fish called Ambli [*Chela phulo* Ham.] and all of the smaller fry including especially Chandwah [*Ambassis ranga* (Ham.)] were netted from a boat in midstream. Chandwah and Chalut [*Notopterus notopterus* (Pallas)] are the dominant species.

i. <i>Notopterus notopterus</i> (Pallas)	... 18 specimens.
ii. <i>Mastacembelus armatus</i> (Lacép.)	... 1 specimen.
iii. <i>Chela phulo</i> Ham.	... 38 specimens.
iv. <i>Danio aequipinnatus</i> (McClell.)	... 5 specimens.
v. <i>Rasbora daniconius</i> (Ham.)	... 1 specimen.
vi. <i>Barbus (Puntius) chola</i> (Ham.)	... 3 specimens.
vii. <i>Barbus (Puntius) kolus</i> Sykes	... 2 specimens.

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viii.	<i>Barbus (Puntius) sarana</i> (Ham.)	...	5 specimens.
ix.	<i>Barbus (Puntius)icto</i> Ham.	...	4 specimens.
x.	<i>Callichrons pabo</i> Ham.	...	2 specimens.
xi.	<i>Mystus Deenghala</i> (Sykes)	...	5 specimens.
xii.	<i>Mystus cavasius</i> (Ham.)	...	1 specimen.
xiii.	<i>Xenentodon cancila</i> (Ham.)	...	1 specimen.
xiv.	<i>Ambassis ranga</i> (Ham.)	...	321 specimens.

11. Junction of the Mutha with the Mula river, called the Sangam. 7-2-1937.

About 80 yards below Wellesly bridge the Mutha river meets the Mula and this junction is known as the Sangam. There is a very large expanse of water here. The direction of the Mutha river is due north. The Mula river after flowing south, is deflected westwards a little above the junction with the Mutha, and from this point the waters of the combined rivers flow in a north-easterly direction. On the east bank at the junction there is a temple and the stretch below this temple on the same bank was explored. There are crowds of people here washing and bathing around and in the temple precincts. The bank is earthy and sloping and parts of it are turfed. The opposite bank is about 10 feet above the water, it is well turfed and sparsely wooded. Between the banks a ferry service operates. There is a strong central current and the depth midstream must be well over 15 feet. The bank which was explored is from 2-6 feet in depth and the bed is silted over an earthy base. Peelah Powwul [*Chela phulo* Ham.] and Deotee [*Rohtee cotio* var. *cunma* Day] appear to be the dominant species in this locality.

i.	<i>Notopterus notopterus</i> (Pallas)	...	3 specimens.
ii.	<i>Chela phulo</i> Ham.	...	24 specimens.
iii.	<i>Rasbora daniconius</i> (Ham.)	...	1 specimen.
iv.	<i>Barbus (Puntius) kolus</i> Sykes	...	4 specimens.
v.	<i>Barbus (Puntius) sarana</i> (Ham.)	...	2 specimens.
vi.	<i>Cirrhhina fulungee</i> Sykes	...	1 specimen.
vii.	<i>Rohtee cotio</i> var. <i>cunma</i> Day	...	29 specimens.
viii.	<i>Rohtee vigorsii</i> Sykes	...	19 specimens.
ix.	<i>Callichrons bimaculatus</i> (Bl.)	...	2 specimens.
x.	<i>Mystus gulio</i> (Ham.)	...	1 specimen.
xi.	<i>Xenentodon cancila</i> (Ham.)	...	2 specimens.
xii.	<i>Ambassis ranga</i> (Ham.)	...	3 specimens.

12. Right bank canal, below the Empress Gardens. 14-2-1937, 6-3-1937, 4-4-1937, and 1-6-1937.

The right bank irrigation canal conducts the waters from lake Fife and runs in an irregular way meandering through Poona, and by a rocky subterranean channel under the race course, reaches the Empress Gardens. From thence it flows south of and almost parallel with the Mutha-Mula river for many miles until it finally terminates at a point about a mile or more south of a village called Nangaon on the Bhim river. In the direct route it is roughly 60 odd miles, but actually is probably 100 miles long. The section explored is the run between the Empress Gardens and the M. S. M. Railway crossing and from thence to the Hardapsar road bridge a total of about 4½ miles. In parts of this stretch the bed is rock and sand and in other sections it is silted over and rankly grown with weeds. The banks stand 15 feet above the water and for the canal's whole length in this section there are broad footpaths on both banks. On both sides of these footpaths the banks are heavily wooded. Those trees on the near side of the water consist chiefly of Date Palms, interspersed with Babul and Pipal, and the branches of some of the latter trees overhang the water to the extent that they nearly touch the water's surface. The off side of each bank is much more wooded and the Mango tree here predominates. About half way in this stretch there is a small village standing 50 yards away from the bank. Its population numbers some 100 persons who use the water for all purposes. The average depth is roughly 4 feet, but in parts it is 8 feet and there is always a large volume of water flowing through it with a very strong current at all times, except for 3 days in the year—2nd to 4th June—when the water is shut off at lake Fife to allow of the channel

being cleared of weeds. The canal is then in the higher parts quite dry, but there are long stretches in its deeper section which contain at least 18 inches of water and the fishes do not suffer very much. The fishes in the batch which have been recovered from the canal should in a fair way represent the range of species which share a preference for strong currents.

i.	<i>Chela clupeoides</i> (Bl.)	...	14 specimens.
ii.	<i>Chela phulo</i> Ham.	...	28 specimens.
iii.	<i>Danio aequipinnatus</i> (McClell.)	...	136 specimens.
iv.	<i>Rasbora daniconius</i> (Ham.)	...	47 specimens.
v.	<i>Barbus (Puntius) amphibius</i> (C.V.)	...	34 specimens.
vi.	<i>Barbus (Puntius) chola</i> (Ham.)	...	11 specimens.
vii.	<i>Barbus (Puntius) jerdoni</i> Day	...	1 specimen.
viii.	<i>Barbus (Puntius) sarana</i> (Ham.)	...	16 specimens.
ix.	<i>Barbus (Puntius) ticto</i> Ham.	...	54 specimens.
x.	<i>Cirrhitina fulungee</i> Sykes	...	2 specimens.
xi.	<i>Crossochilus latius</i> (Ham.)	...	22 specimens.
xii.	<i>Garra mullya</i> (Sykes)	...	13 specimens.
xiii.	<i>Labeo boggut</i> (Sykes)	...	5 specimens.
xiv.	<i>Rohitee cotio</i> var. <i>cunma</i> Day	...	2 specimens.
xv.	<i>Rohitee vigorsii</i> Sykes	...	1 specimen.
xvi.	<i>Lepidocephalus guntea</i> (Ham.)	...	1 specimen.
xvii.	<i>Nemachilus botia</i> var. <i>aureus</i> Day	...	3 specimens.
xviii.	<i>Nemachilus dayi</i> Hora	...	1 specimen.
xix.	<i>Callichrons bimaculatus</i> (Bl.)	...	3 specimens.
xx.	<i>Mystus cavasius</i> (Ham.)	...	4 specimens.
xxi.	<i>Aplocheilichthys lineatus</i> (C.V.)	...	1 specimen.
xxii.	<i>Xenentodon cancila</i> (Ham.)	...	7 specimens.
xxiii.	<i>Ambassis ranga</i> (Ham.)	...	11 specimens.
xxiv.	<i>Glossogobius giuris</i> (Ham.)	...	10 specimens.

13. Stretch of the Mula river near to the Central Mental Hospital, Yeravda. 21-2-1937 and 24-2-1937.

The fishes were taken from the stretch of about a furlong length which runs by the Central Mental Hospital, Yeravda. The Mula river here flows in a fairly straight course from north to south and the banks therefore lie east and west. There is a broad expanse of water here about 50 yards across, and there is a sluggish current which bears directly against the west bank which is practically bare of vegetation and consists of rocky plinths sloping to the water's edge with large boulders interspersed here and there. The east bank on which lie the vegetable and fruit producing lands controlled by the authorities of the Central Mental Hospital, Yeravda, is entirely earthy, but nearer the water's edge in certain parts there is evidence of a rocky foundation underlying. This bank is precipitous and stands about 30 feet above the water. The depth in this run would be at least 15 feet midstream. Near the bank it is 3 feet for about 5 yards and then suddenly deepens to over 8 feet. The bed appears to be rocky and silted over. The silted area is grown with weeds. There is evidence also that there is a strong undercurrent about midstream, where eddies are visible and in using a rod and line one's float is drawn down, but this happens only occasionally and objects such as leaves floating on the surface of the water are seen moving very slowly.

i.	<i>Notopterus notopterus</i> (Pallas)	...	2 specimens.
ii.	<i>Mastacembelus armatus</i> (Lacép.)	...	1 specimen.
iii.	<i>Chela boopis</i> Day	...	1 specimen.
iv.	<i>Barbus (Puntius) jerdoni</i> Day	...	1 specimen.
v.	<i>Barbus (Puntius) kolus</i> Sykes	...	1 specimen.
vi.	<i>Barbus (Puntius) sarana</i> (Ham.)	...	2 specimens.
vii.	<i>Barbus (Puntius) ticto</i> Ham.	...	1 specimen.
viii.	<i>Cirrhitina fulungee</i> Sykes	...	19 specimens.
ix.	<i>Garra mullya</i> (Sykes)	...	4 specimens.
x.	<i>Rohitee cotio</i> var. <i>cunma</i> Day	...	2 specimens.
xi.	<i>Ophicephalus marulius</i> Ham.	...	41 specimens.
xii.	<i>Ambassis ranga</i> (Ham.)	...	1 specimen.
xiii.	<i>Glossogobius giuris</i> (Ham.)	...	15 specimens.
		...	12 specimens.

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14. Stretch of the Mula river east of Holkar bridge. 28-2-1937.

The fishes were taken from the stretch of about 400 yards east of Holkar bridge. The Mula river here flows in a practically straight course from east to west and the banks lie north and south respectively. There is a large expanse and volume of water with a strong midstream current and a flow of less intensity near the banks. The north bank is heavily wooded with Pipal, Mango, Tamarind, and Babul. Their branches, in parts, overhang and touch the water. At the water's edge there is a heavy growth of rushes and weeds. The south bank is less wooded and the trees are all Babul. This bank is turfed up to the water's edge where in the greater part of its length there is a thick growth of weeds. The base of the bank is practically all rock with an earthy layer overlying, and in the parts which are breached there are pockets of stagnant water 18 inches deep with much algae in evidence. The bed of the river on the south bank is practically all rock and the greater portion is silted over. The depth midstream must be well over 15 feet and near the south bank 3-4 feet. The width of the river is the length of the bridge which is 90 yards long and 35 feet above the water line.

i. <i>Notopterus notopterus</i> (Pallas)	... 2 specimens.
ii. <i>Chela clupeoides</i> (Bl.)	... 3 specimens.
iii. <i>Chela phulo</i> (Ham.)	... 30 specimens.
iv. <i>Barbus (Puntius) amphibius</i> (C.V.)	... 1 specimen.
v. <i>Barbus (Puntius) kolus</i>	... 3 specimens.
vi. <i>Barbus (Puntius) sarana</i> (Ham.)	... 4 specimens.
vii. <i>Cirrhitina fulungee</i> (Sykes)	... 2 specimens.
viii. <i>Garra mullya</i> (Sykes)	... 2 specimens.
ix. <i>Labeo potail</i> (Sykes)	... 9 specimens.
x. <i>Rohitee cotio</i> var. <i>cunna</i> Day	... 10 specimens.
xi. <i>Rohitee vigorsii</i> Sykes	... 1 specimen.
xii. <i>Callichrons pabo</i> Ham.	... 1 specimen.
xiii. <i>Procutropichthys taakree</i> (Sykes)	... 3 specimens.
xiv. <i>Xenentodon cancila</i> (Ham.)	... 7 specimens.

15. Section of the Mula river near Bopkhel. 14-3-1937.

In this section the Mula river runs in a loop. The reach explored is the portion of this loop which flows due east. The width here is about 60 yards, and there is a fair volume of water with a central current which is moderately strong. The depth at the sides is 3-4 feet and centrally it is at least 10 feet. The surrounding country is bare of vegetation except for a few Babul trees. The banks are rocky and slope to the water's edge and are 20 feet above the water. The surface of both banks shows strata of shingle and the adjacent land is in the nature of shingle with rock showing here and there and covered with a thin earthy layer which is turfed. The bed of the river is rock and sand and parts of it are silted.

i. <i>Chela phulo</i> Ham.	... 2 specimens.
ii. <i>Barbus (Puntius) jerdoni</i> Day	... 1 specimen.
iii. <i>Barbus (Puntius) kolus</i> Sykes	... 2 specimens.
iv. <i>Barbus (Puntius) sarana</i> (Ham.)	... 4 specimens.
v. <i>Labeo boggut</i> (Sykes)	... 1 specimen.
vi. <i>Rohitee cotio</i> var. <i>cunna</i> Day	... 1 specimen.
vii. <i>Ambassis ranga</i> (Ham.)	... 1 specimen.

16. Tanks (catchment areas) at Katraj village. 21-3-1937.

There are two tanks here near to the village of Katraj which has a population of about 2,000 inhabitants. The majority of this number are low caste men called 'Mahars' and they use the water in the upper tank, which is nearer the village, for all purposes. The high caste section of the village use a well which is located on high ground between the upper and lower tanks. The upper one is higher, placed at a height of roughly 50 feet or more above the lower. There is a drainage channel between the two by which water, dependent upon the level of it in the upper, flows into the lower tank and the distance between them is one furlong and a half. The upper tank is one quarter

the size of the lower and both are catchments which fill up during the rains. There are no perennial streams feeding it and no springs. Both have dams of solid masonry. The upper dam is about 50 yards long and 8 feet broad and the lower is 200 yards long and 15 feet broad. The unfiltered water in the tanks is used by the Poona Suburban Municipality for watering roads. A pipe line from the lower tank conducts water for this purpose, presumably by gravity as there is no engine house in the near precincts. The upper tank is 50 yards long and 30 yards broad with a depth of 4 feet in its deepest part near the dam and 2 feet in the shallows. The lower tank is some 300 yards long and 200 yards broad with a depth of 6-8 feet in its deepest parts against the dam and 1-3 feet in the shallows. The height above sea level is roughly 2,440 feet. The singular peculiarity here is that the upper tank had all the fish in plenty. A few casts of the net brought in many. On the other hand although the larger tank was systematically surveyed every 25 yards or so—each cast, and there were many—recovered on an average one fish per cast. Instead of fish the net enmeshed a giant species of aquatic beetle in such numbers as to constitute a nuisance. These beetles appear to be the cause for the absence of fish in the shallows near the margin of the tank. There was no boat available here to explore the deeper sections. The fisherman who was with me states the beetles kill the fish. In all probability the fishes have been driven into the middle of the tank in its deeper parts. About 30 wild duck were in the middle and a variety of other aquatic birds in the neighbourhood. Except in the section against the dam, the margins of the tank had a growth of weeds and much algae. The upper tank had a small amount of algae but no weeds. The banks of both tanks are earthy and turfed over, and the terrain is fairly well wooded with Babul and Mango and near the banks are some Babul trees.

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|--------------------------------------------------------|--------------------|
| i. <i>Rasbora daniconius</i> (Ham.) | ... 130 specimens. |
| ii. <i>Garra mūllya</i> (Sykes) | ... 87 specimens. |
| iii. <i>Parapsilorhynchus tentaculatus</i>
(Annan.) | ... 1 specimen. |
| iv. <i>Lepidocephalus guntea</i> (Ham.) | ... 4 specimens. |

17. Section directly above the Bund. 2-5-1937.

The section above the bund shows a wide expanse of water and is the length of the bund—about 150 yards in extent. At the time of the visit there was no water falling over the bund except a small rush through an exit in the masonry construction near the bund garden end. The flow of the river is to the east and the part of it against the north bank was explored. This bank is practically all rock and slopes to the water's edge. There was a large collection of an aquatic plant (the duck weed, referred to above in the general description of the river) spread over the surface of the water for the whole extent of the bund and above it for a distance of about 50 yards. The water above this again was clear of the weed and it was here that the fishes were caught. The bed appears to be all rock and there was no evidence of any current. The depth was from 2-6 feet near the bank. Higher up and nearer the road to Kirkee there were some Pipal and Tamarind trees which are 50 feet above and 30 yards from the water's edge. In the shallow margin there were some weeds and algae, particularly in the portions where the rocky base is silted up.

- | | |
|----------------------------------------------|------------------|
| i. <i>Barbus (Puntius) dobsoni</i> Day | ... 2 specimens. |
| ii. <i>Barbus (Puntius) sarana</i> (Ham.) | ... 4 specimens. |
| iii. <i>Cirrhitina fulungee</i> (Sykes) | ... 5 specimens. |
| iv. <i>Ophicephalus leucopunctatus</i> Sykes | ... 1 specimen. |

18. Mutha river in the section above the bridge called Lakri Pool. 29-5-1937.

The section explored was the run near the concrete causeway connecting the east bank on which Poona City lies with the west bank by which the road to Piranghat, Paud, and Mulshi lake passes. The causeway is roughly 400 yards south from and above Lakri Pool. The flow of the river is slightly north-easterly and in this section it is divided into two streams one running by the east bank and the other by the west bank. This latter stream has the

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lesser volume of water. Directly above the causeway both streams unite to form a large collection of water in the depression which here exists, and the fishes in this batch were secured here. Except for a surface flow which is very sluggish against both the banks there is no current and the water is stagnant and foul smelling. Drove of cattle are driven into this pool to wallow about in it. Crowds of people also bathe and wash clothes here. Below the causeway and extending up to Lakri Pool between the two streams is a pebbled beach. Above the causeway the collection of water, which is about 100 yards long and 130 yards broad, there is a similar pebbled stretch between the two streams. The width between the two banks proper is some 150 yards and the banks are earthy and slope down to the water from a height of about 30-40 feet. The depth in this pool is from 2 feet in the shallows to 5 feet in its deepest portions. The bed is earthy and silted over and in parts grown with weeds and algae. Directly where the two streams merge to form the pool the bed is sanded and silted. There is a large amount of mud in suspension as a result of cattle being driven into this pool. The flow in the streams is very sluggish.

i. <i>Chela boopis</i> Day	... 12 specimens.
ii. <i>Chela phido</i> (Ham.)	... 1 specimen.
iii. <i>Barbus (Puntius) kolus</i> Sykes	... 5 specimens.
iv. <i>Cirrhitina fulungee</i> (Sykes)	... 5 specimen.
v. <i>Garra mullva</i> (Sykes)	... 3 specimens.
vi. <i>Nemachilichthys ruppelli</i> (Sykes)	... 7 specimen.
vii. <i>Nemachilus botia</i> var. <i>aureus</i> Day	... 57 specimens.
viii. <i>Nemachilus dayi</i> Hora	... 3 specimens.
ix. <i>Ophicephalus gachua</i> Ham.	... 1 specimen.

19. A stagnant pool on the south bank of the Mutha-Mula river. 28-6-1937.

The pool is stagnant and very foul with evidence of sulphuretted hydrogen emanations. There is a heavy scum on the greater portion of its surface with fragments of floating algae. This collection of water is due to an ooze through the rocky strata of which it is mainly composed. There are large boulders flanking one side and also in the near precincts, and some portions of the bank and bed at the edges of the pool have an earthy deposit which is overgrown with long grasses and weeds. The bed is practically rocky throughout and grown with algae. The average depth is 18 inches and not more than 2 feet in its deepest parts. It is circular in shape with a diameter of 5 yards. The water is turbid, ashen in colour and foul smelling. The overflow is carried through a narrow channel (2 feet wide) which drains directly into the river. The pool is located on high ground near the south bank of the Mutha-Mula river between it and a sewage plant roughly about $2\frac{1}{2}$ miles east of Fitzgerald bridge. The fish called Konkani Garah [*Aplochilus lineatus* (C. V.)] is the only species in the pool. The single specimen of a baby Murrel [*Ophicephalus gachua* Ham.] in this batch was secured in the river end of the channel connecting the pool with the river.

i. <i>Aplochilus lineatus</i> (C. V.)	... 10 specimens.
ii. <i>Ophicephalus gachua</i> . Ham.	... 1 specimen.

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A CONTRIBUTION TO THE STUDY OF THE BIOLOGY AND PHYSIOLOGICAL ANATOMY OF INDIAN MARSH AND AQUATIC PLANTS.

PART II.

BY

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(With three plates).

(Continued from p. 304 of Vol. xlii, No. 2).

ELATINACEAE.

The *Elatinaceae* is a very small family containing only about 40 species in 2 genera, viz. *Elatine* and *Bergia*, widely distributed through the tropical and temperate regions of both hemispheres. They are generally small annual herbs for the most part living in water or on mud, with creeping stems rooting at the nodes and simple, opposite or whorled leaves with interpetiolar stipules. We owe our information regarding the anatomy of this family chiefly to the statements of Neidenzu (10).

KEY TO THE GENERA.

- A. Sepals obtuse, aquatic herbs..... 1 *Elatine*.
B. Sepals acute, fls. 5-merous..... 2 *Bergia*.

The genus *Elatine* comprising 15 species of minute, glabrous aquatic or marsh annuals is spread over the northern hemisphere in the New as well as the Old World. Several of its species are amphibious and have been found to possess both land and water forms (6). Its best known members are the two British species *E. hexandra* DC. and *E. Hydropiper* Linn. (Water-pepper or Pipewort) which occur in Britain and Ireland and are scattered, though sparsely, over a wide range in Europe and North Asia. But what appears to be the most completely adapted plant of this family for aquatic life is *E. Alsinistrum* Linn., the whorled Waterwort of Europe and North Africa, which in addition to the characteristic air-passages and other aquatic features displays a well marked heterophylly described by Kerner (8) as follows: 'The aerial leaves are grouped in whorls of three. They have an ovate shape, and their margins are finely notched. Each is traversed by 3-5 veins. The leaves developed under water are divided almost their whole length into 3-4 narrow linear segments, and each whorl looks as if it were composed of twelve leaves. Each segment is smooth round the edge and traversed only by one central vein.' Two Indian species of *Elatine* have been recorded, viz. *E. americana* Arn. found in the Nilgiris and spread over New Zealand and Australia, and *E. ambigua* Wight occurring in the Western Peninsula and also in the Fiji Islands. They are insignificant and little known.

Three Indian species of *Bergia* are known, viz. *B. odorata* Edgew., *B. ammannioides* Roxb. and *B. capensis* Linn. Of these the latter two species are described in the Floras as aquatic or semiaquatic and are actually recorded from such habitats. *B. odorata*, on the other hand has no definite aquatic localities against it and is regarded as a terrestrial plant. Saxton (14) however mentions it in his *synosium* of Marsh plants, but adds that it also appears as a xerophytic type on land which is not swampy. Sabnis (5, 13) has described the anatomy of *B. odorata* and *B. ammannioides*, in both of which he has found a typical xerophytic structure indicating that he was dealing with plants taken from dry habitats.

It would appear from these conflicting accounts that both *B. odorata* and *B. ammannioides* are terrestrial plants that are capable, on occasion, of living under marsh or aquatic conditions. *B. capensis*, on the other hand, is a habitual marsh plant, and though it has not attained the marked specialization recorded for *Elatine Alsinistrum*, it possesses certain features in its external and internal morphology which are unmistakably adaptations to an

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aquatic mode of life. In the light of what has been said above in regard to the habitats of the species of *Bergia* the following key to the Indian species will be found to be more correct than the conventional one given in the Floras :—

KEY TO THE INDIAN SPECIES.

- A. Plants usually terrestrial woody.
 a. Stamens 10..... *B. odorata*.
 b. Stamens 5..... *B. ammannioides*.
 B. Plants usually aquatic, succulent,
 a. Stamens 10..... *B. capensis*.

Since *Bergia capensis* Linn. is the only Indian species definitely aquatic and is pretty common in India we take it for special study.

SYNONYMY.

Bergia capensis Linn. Mantiss. (1771), 241.

= *B. aquatica* Roxb.

= *B. verticillata* Willd.

= *Elatine verticillata* W. & A.

The plant grows on the margins of tanks and in ricefields. It is found in Bombay, Salsette, and in the Konkan and Deccan. It occurs also in other parts of India, and is distributed to Ceylon, Rangoon, Tropical Africa and Egypt. It usually lives partially submerged in water and also on mud in the rains, and scarcely survives the monsoon, dying, after seeding, almost as soon as the ground on which it lives becomes dried up. It is an annual glabrous succulent herb 15-30 cm. high, with branches decumbent or ascending. The stem and branches are pink, translucent, making visible, through the surface, the narrow central cylinder and the radially arranged partitions of the cortical air-spaces which make the stem appear ribbed. The leaves, even those which happen to be submerged, show no special aquatic features. They are ill-adapted for life under water and decay on submergence. They are 2.6-4 cm. by .7-1 cm., simple, opposite, elliptic-lanceolate, serrate, glabrous with short petioles and triangular-acute caducous stipules. The flowers are minute and occur in sessile or subsessile axillary clusters. The primary root is short-lived. It is soon replaced by a system of adventitious roots coming off from the lower nodes. In plants that grow partially or completely submerged, the roots show a differentiation into two kinds, viz. ground roots or mud roots (Figs. 1 and 2, M) and water roots (Figs. 1 and 2, W). The ground roots, i.e. those buried in the mud, are stout and white and they bear few slender threadlike branches. Root-hairs are present on the mud roots and are not confined as in most ordinary roots, to a small region above the root tip, but are spread all over the main roots and branches. The water roots, i.e. those which come off from the submerged nodes and float freely in the water, are thinner, more profusely branched, feathery in appearance, devoid of root-hairs and frequently green, simulating both in form and function the adventitious floating roots (2), the so-called 'pectinate organs' of *Trapa* (4). It may be mentioned that a differentiation of roots somewhat similar to those just described for *Bergia capensis* has been observed also in other water plants (1,7,11).

The anatomy of the plant is in conformity with its semi-aquatic mode of life. The transverse section of the stem (Fig. 3) closely resembles the figure given by Schenck (15) for the transverse section of the stem of *Elatine Alsinastrum*. The epidermis (Fig. 3, Ep, Figs. 5 and 6) consists of tabular cells elongated in the direction of the length of the axis and with the outer walls somewhat thickened in the subaerial parts. Chloroplasts are present in the epidermal cells of the submerged parts. Stomata are absent. Beneath the epidermis is a hypodermis (Hyp) of 4-5 layers of compactly arranged parenchymatous elements. The cortex is traversed by wide vertical air-passages or lacunae (Lac) separated from one another by single-layered radially arranged parenchymatous plates or partitions (RP) whose cells show a tendency for radial elongation the more so in the submerged portions of the stem (Fig. 3). The partitions are compactly built up and, viewed from the side (Fig. 7),

show no lateral outlets in the shape of intercellular spaces connecting adjoining lacunae, an arrangement calculated, it would appear, to effect an expeditious passage of air to the underground parts. The cortex on the inner side of the lacunae is only about 2 or 3 layers thick including the endodermis (End in Figs. 3 and 9) which latter in transverse section can be recognized as a band of thin-walled barrel-shaped cells. Chloroplasts are present in the cortical cells and are in greater abundance in the cells lining the cortical air-spaces. A pink pigment (anthocyanin) may be present in the cells of the epidermis and also in the innermost layers (including the endodermis). The cortical passages, however, are interrupted at the nodes by many-layered diaphragms which have intercellular spaces at the angles of the cells (Fig. 8) facilitating vertical communication between superposed air-passages. These nodal diaphragms are crowded with conglomerate crystals and contain abundant chloroplasts. Unlike *B. ammannioides* and *B. odorata* a sclerenchymatous pericycle is absent and the wood vessels are scarcely, if at all, lignified. In transverse section (Fig. 4) the wood vessels are seen to be arranged in radial rows separated by rays of parenchymatous cells extending to the pith. The pith is parenchymatous with intercellular spaces. Chloroplasts are present in the pith, especially in the neighbourhood of the xylem, and in the medullary rays.

The leaves show a mesophytic structure which, as the plant grows usually in saturated soil or in shallow water, grades towards the aquatic type especially in regard to the development of air-spaces. In the lamina the upper and lower epidermis consists of tabular cells (Figs. 10 and 11) which in surface view (Figs. 12 and 13) have wavy outlines. The thickening and cutinization of the epidermal cell-walls varies with the conditions of moisture in which the plant is growing. It is slight in plants growing in water but increases appreciably under drier conditions. There are no chloroplasts in the epidermal cells. Stomata are found on both the upper and lower surfaces being more abundant on the lower side as will be seen by comparing Figs. 12 and 13 which are drawn to the same scale. The guard-cells are more or less level with the ordinary epidermal cells. The mesophyll is bifacial. The palisade tissue is relatively thinner than the spongy part. It is represented by short cells, packed with chloroplasts, arranged in 3-4 rows. Though disposed in palisade fashion the cells are not very compactly arranged allowing for a free communication with the exterior through the stomata. The spongy tissue is made up of isodiametric cells more or less oval, rounded, or irregular-shaped. They are more loosely arranged than the palisade cells and contain fewer chloroplasts. The vascular bundles of the leaf-blade are surrounded by sheaths of clear cells. They are poorly lignified and there is, except for the slight thickening of the outer epidermal walls when the plant grows under drier conditions, scarcely any mechanical tissue formed. In the mid-rib, however, there is some development of mechanical tissue (Figs. 14 and 15). Both the upper and lower epidermal cells have their walls considerably thickened especially on the outer side. Further, on the depressed upper side the usual mesophyll is replaced by mechanical tissue (*m* in Fig. 10) composed of thick-walled cells. A parenchymatous tissue of clear cells with large air-spaces (Fig. 10) makes up the greater part of the prominent underside of the mid-rib which also contains a strongly developed vascular strand occupying the centre (Fig. 10).

According to Solereder (19) the air-passages (which are found in the stem of *B. aquatica* Roxb. (= *B. capensis* Linn.) and in all species of *Elatine*) recur in the primary cortex of the root where they are traversed by radial filaments of parenchymatous cells. This description would be applicable only to the floating water roots of *B. capensis* for there is a marked difference in structure between these water roots and the ground roots buried in the mud. In the former (Fig. 16) beneath the superficial layer (*Ep*) composed of thin-walled tabular cells there is a hypoderma (*Hyp*) of about 3 layers of parenchyma and inside this the cortical lacunae are seen, in transverse section, to be separated by radial filaments (*RF*) composed of more or less rounded or oval cells. Chloroplasts are present in the cells of the cortex abutting on the lacunae. The stele is very narrow relatively to the diameter of the root. In the ground root also the stele is much reduced in width. In the transverse section of such a root (Fig. 17) the cortex is seen to be much wider. Beneath the superficial layer (*Ep*) is a hypoderma (*Hyp*) of

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two layers of parenchymatous cells. The rest of the cortex appears to be made up of radial filaments (RF) of mostly elongated cells. These filaments are separated from one another by wide radially running gaps or spaces. In longitudinal section (Figs. 18, 19, 20) these radial filaments or chains are seen to be connected with filaments lying above and below them by means of vertical arms of certain irregular shaped cells belonging to the filaments. These meet corresponding arms of similar cells composing the filaments that lie above and below. In this way successive tiers of filaments are connected vertically. Connection between an upper and lower tier may also be effected by the oblique direction of a whole radial filament or of one of the arms of the cells composing it. A connection between two adjacent filaments of the same tier may also be brought about by branching in the horizontal plane or simply by the oblique direction of a filament (Fig. 17). The result of all this branching and anastomosis is a complicated spongy structure which closely resembles the loose air-containing tissue found by several observers (3, 9, 12, 16, 17, 18, 20) in plants growing in marshy situations and regarded as a secondary tissue developed from a phellogen, the so-called 'aerenchyma' of Schenck (16). Whether the spongy cortex of the root of *Bergia capensis* is really an aerenchyma in the true sense, i.e. a secondary air-containing tissue developed from a phellogen, is doubtful. The plant shows no secondary development of tissues in its other parts and there is no trace of a phellogen in the root. The presumption would therefore be in favour of regarding this tissue found in the ground roots as a primary cortex developed in loose fashion after the manner of an aerenchyma in response to the condition of diminished aeration in the water-logged mud. The differences in external and internal features observable between the water and the mud roots are clearly related to their respective conditions of life. The profuse branching of the water roots, by increasing the absorbing surface and establishing intimate contact with the surrounding medium, facilitates absorption. The presence of chloroplasts in these roots indicates that the roots are also photosynthetic in function, and the occurrence of the chloroplasts in the very cells that abut on the air-spaces of the cortex while facilitating gas interchange between these cells and the air-spaces, renders possible the much needed accumulation of oxygen given off in the process. The mud roots, on the other hand, in addition to their ordinary function of fixation and absorption, serve as reservoirs of air and thus help indirectly in respiration.

REFERENCES

1. Arber, A., 1920.—Water Plants. Cambridge 1920.
2. Barnéoud, F. M., 1848.—Mémoire sur l'anatomie et l'organogénie du *Typha latifolia* (Linn.). Ann. d. sci. nat. Sér. III. Bot. T. IX. 1848, pp. 222-244, 4 pls.
3. Batten, L. 1918.—Observations on the Ecology of *Epilobium hirsutum*. Journ. Ecology, Vol. VI, 1918, pp. 161-77.
4. Blatter, E., 1906.—The 'Pectinate Organs' of *Typha bispinosa*, Rostk. (Water-chestnut), Journ. Bomb. Nat. Hist. Soc. April 23, 1906.
5. Blatter, E., McCann, C. and Sabnis, T. S., 1929.—Flora of the Indus Delta. Part VII D. Anatomy. Journ. Ind. Bot. Soc., Vol. viii, No. 1, 1929, pp. 19-77.
6. Glück, H., 1911.—Biologische und morphologische Untersuchungen über Wasser- und Sumpfgewächse. III Die Uferflora XXXIV+644 pp., 8 pls., 105 text-figs. Jena, 1911.
7. Hildebrand, F., 1885.—Über *Heteranthera zosterifolia*. Engler's Bot. Jahrbüch. Bd. VI, 1885, pp. 137-145, 1 pl.
8. Kerner, A. and Oliver, F. W., 1894-1895.—The Natural History of Plants. 2 vols., 1760 pp., 1000 figs., 16 pls.
9. Lewakoffski, N., 1873.—Ueber den Einfluss des Wassers auf das Wachstum der Stengel und Wurzeln einiger Pflanzen. (Gelehrte Schriften der K. Universität in Kasan, 1873). Abstracted in Just's Bot. Jahresbericht, Jahrg. I, 1873, p. 594.
10. Neidenzu, 1895.—In Naturl. Pflanzenfam., Teil, Abt. 6, 1895, 278.
11. Pallas, M. 1916.—The Structure and History of *Typha*: The Floating Fen of the Delta of the Danube. Journ. Linn Soc. Bot., Vol. 43, 1916, pp. 233-299, 15 pls., 1 text-fig.

12. Rosanoff, S., 1871.—Ueber den Bau der Schwimmorgan von *Desmanthus natans* Willd.. Bot. Zeit. Jahrg. 29, 1871, pp. 829-38.
13. Sabais, T. S., 1919-21.—The Physiological Anatomy of the Plants of the Indian Desert. *Journ. Ind. Bot.*, Vols. I and II, 1919-1921.
14. Saxton, W. T., 1924.—Phases of Vegetation under Monsoon conditions. *Journ. Ecology*, Vol. XII, No. 1, pp. 1-38, 1924.
15. Schenck, H., 1886.—Vergleichende Anatomie der submersen Gewächse. *Bibliotheca Botanica*, Bd. I., Heft. I, 1886, 67 pp. 10 pls.
16. Schenck, H., 1889.—Ueber das Aerenchym, ein dem Kork homologes Gewebe bei Sumpfpflanzen. *Pringsheim's Jahrb. f. wissen. Bot.* Bd. XX, 1889, pp. 526-574, 6 pls.
17. Schrenk, J., 1889.—On the Floating-tissue of *Nesaea verticillata* (L.) H. B. K. *Bull. Torr. Bot. Club*, Vol. XVI, 1889, pp. 315-323, 3 pls.
18. Scott, D. H. and Wager, H., 1888.—On the Floating Roots of *Sesbania aculeata* Pers. *Ann. Bot.* Vol. I, 1887-1888, pp. 397-44.
19. Solereder, Hans, 1908.—Systematic Anatomy of the Dicotyledons, English Translation by Boodle and Fritsch, Oxford, 1908.
20. Witte, H., 1906.—Ueber das Vorkommen eines aerenchymatischen Gewebes bei *Lysimachia vulgaris*, L. *Botaniska Studier*, Tillagnade F. R. Kjellman, Uppsala, 1906, pp. 265-274.

EXPLANATION OF PLATES.

Bergia capensis Linn.

PLATE I.

Fig. 1.—A habit drawing of the plant growing partially submerged. W, water roots; M, mud roots.

Fig. 2.—Mud root (M) and water root (W) enlarged.

PLATE II.

Fig. 3.—T.S. of the stem (aerial portion) of a plant which had been growing in water. *Ep*, epidermis; *Hyp*, hypoderma; *Lac*, lacuna; *RP*, radial partition wall; *End*, endodermis; *Ph*, phloem; *Xy*, xylem; *P*, pith. (× 40).

Fig. 4.—Portion of the T.S. of the same stem as above (submerged portion) showing radial elongation of the cells composing the partition walls (*RP*). (× 40).

Fig. 5.—Epidermis of Stem (surface view). (× 120).

Fig. 6.—Epidermis of Stem in T.S. and one layer of hypoderma. (× 120).

Fig. 7.—Side view of a radial partition wall as seen in a l.s. of the stem. No intercellular are visible between the cells. (× 40).

Fig. 8.—T.S. of stem showing the nodal diaphragm tissue. (× 120).

Fig. 9.—T.S. of stem showing stelar region. *End*, endodermis; *Xy*, xylem; *P*, pith. (× 120).

PLATE III.

Fig. 10.—(a) T.S. (diagrammatic) of the leaf showing the disposition of the various tissues. *p*, palisade tissue; *s*, spongy tissue; *m*, mechanical tissue on upper side of midrib; *l*, lacunar tissue of clear cells on under side of midrib; *vb*, vascular bundle. (× 20).

(b) T.S. (diagrammatic) of the leaf nearer the base than above showing the air-spaces in the region of the midrib. (× 20).

Fig. 11.—T.S. of the leaf. (× 96).

Fig. 12.—Upper epidermis of the leaf (surface view). (× 96).

Fig. 13.—Lower epidermis of the leaf (surface view). (× 96).

Fig. 14.—T.S. of the leaf showing the midrib tissue on the upper side. (× 96).

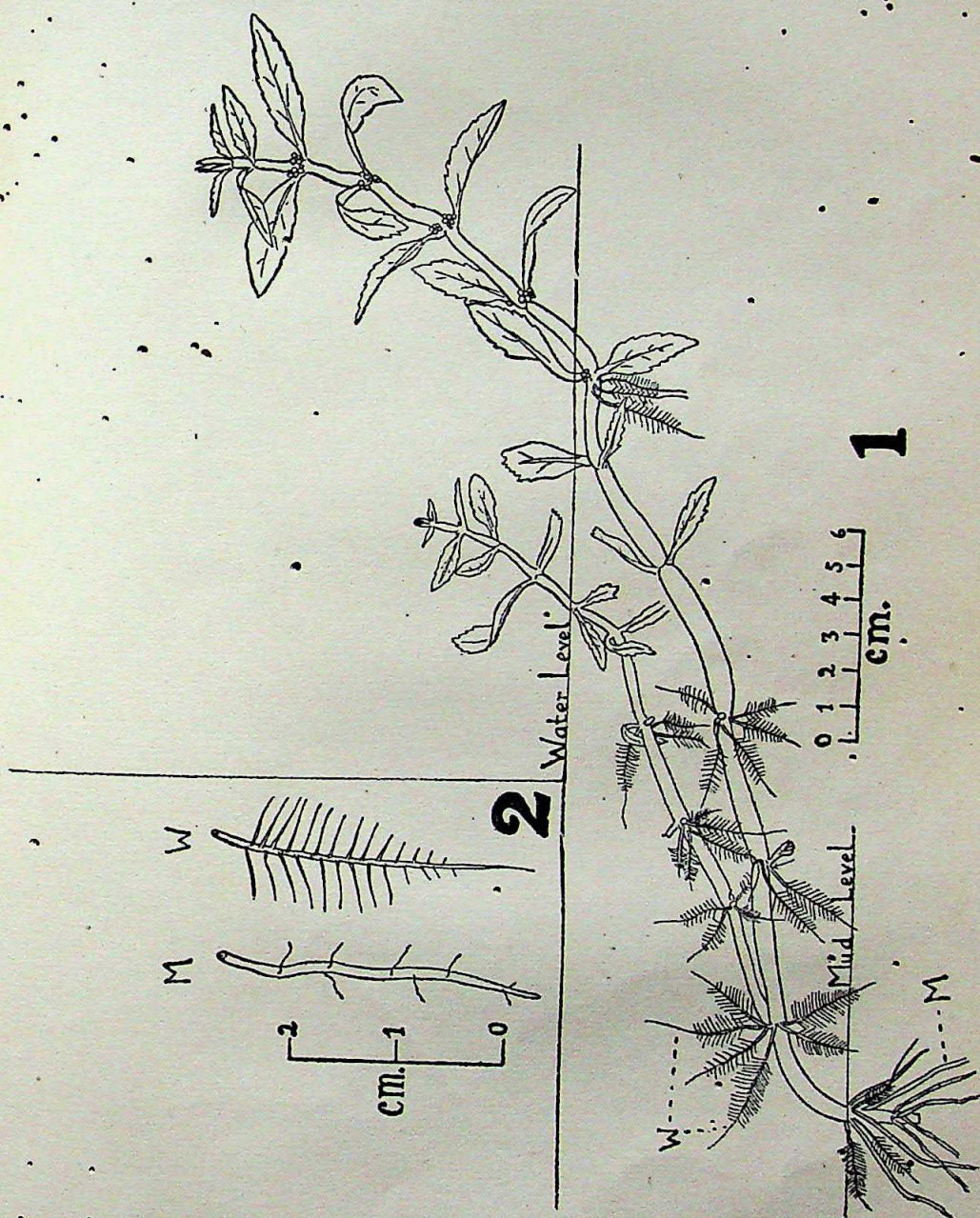
Fig. 15.—T.S. of the leaf showing the midrib tissue on the under side. (× 96).

Fig. 16.—T.S. of water root. *Ep*, epidermis; *Hyp*, hypoderma; *RF*, radial filaments; *End*, endodermis. (× 72).

Fig. 17.—T.S. of a mud root. Lettering as in Fig. 16. (× 72).

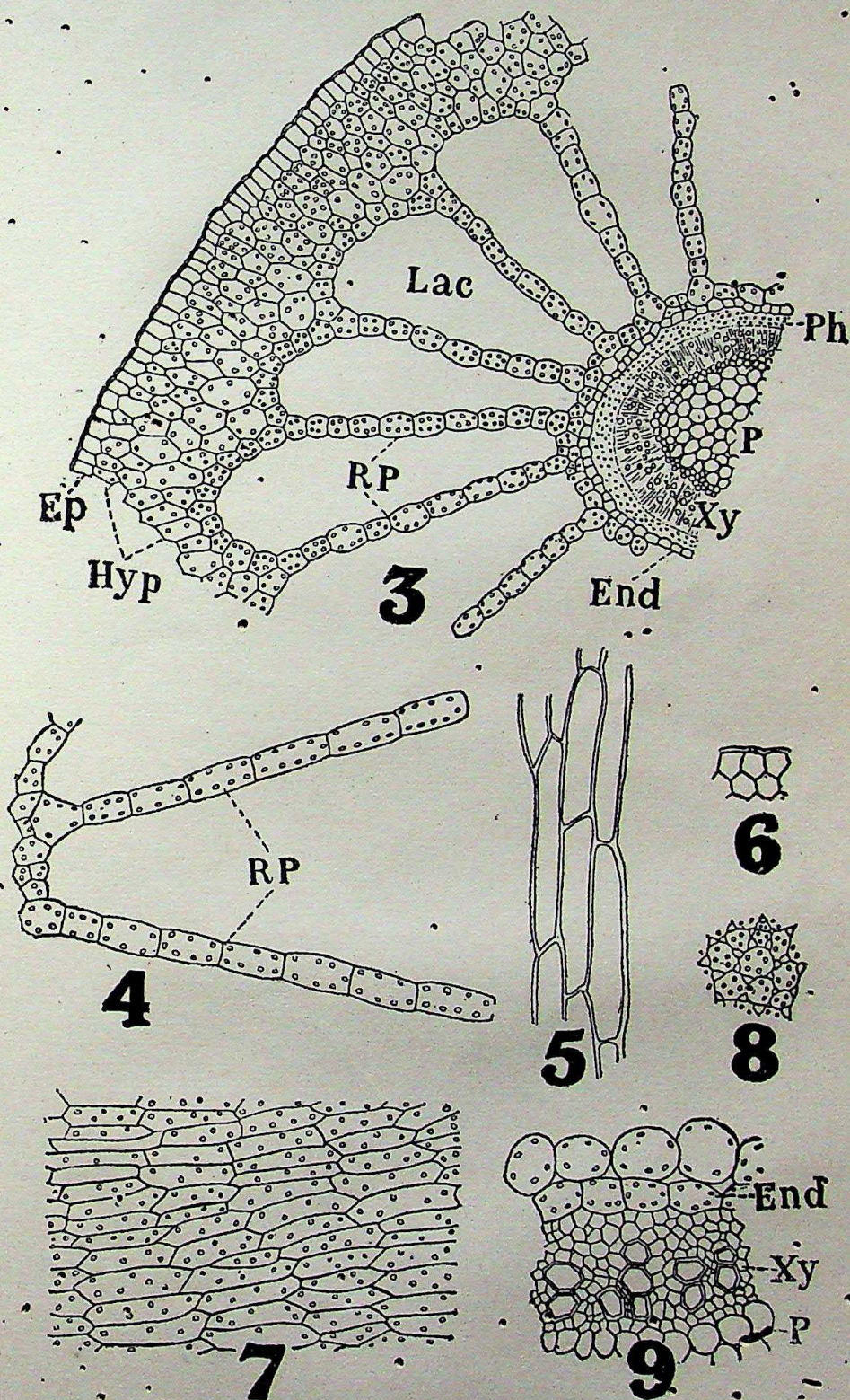
Figs. 18, 19 and 20.—Radial L.S. through mud root showing the various shapes of the cells composing the radial filaments, as well as the vertical connections between the successive tiers of filaments. (Fig. 18: × 48; Figs. 19 and 20: × 72).

(To be continued).



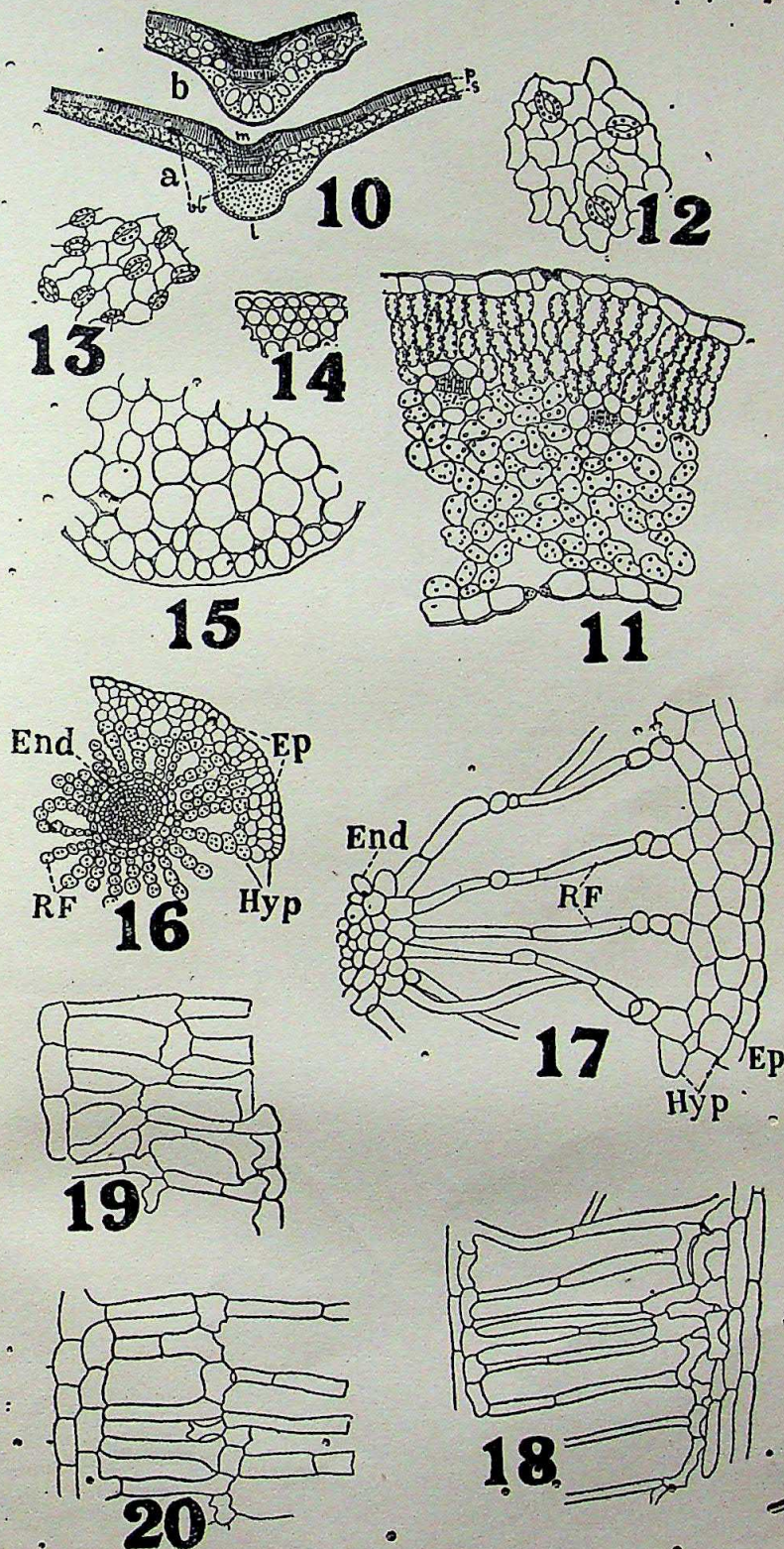
D'Almeida—INDIAN MARSH AND AQUATIC PLANTS.

For explanation see end of article.



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D'Almeida—INDIAN MARSH AND AQUATIC PLANTS.

For explanation see end of article.

REVIEWS

I.—SHELLS AND OTHER ANIMAL REMAINS FOUND ON THE MADRAS BEACH.—1. Groups other than Snails, etc. By F. H. Gravely (*Bull. Madras Govt. Museum* (n.s.), *Nat. Hist. Sect.* Vol. V, No. 1, pp. 1-112, figs. 1-30; December, 1941).

In India collectors of shells and Natural History objects in general are greatly handicapped for want of suitably illustrated handy volumes for identification of the material that is easily available, often in large quantities, on sandy beaches along the shores. Dr. Gravely has rendered a real service to the cause of Natural Science in general and to collectors of shells in particular by providing in the work under review a guide for the identification of the bivalves and animal remains, except for snails¹ etc., that are likely to be found 'on the sandy beaches of Madras and other places on the Coromandel and Golkonda Coasts, and even perhaps beyond'. The shells of molluscs form the majority of the animal remains washed up on sandy beaches, but other animals such as Protozoa, sponges, corals, jelly fish, among Coelenterata, Ctenophora, Platyhelminths, Nemertine and segmented worms, Polyzoa, Brachiopods, Cephalopoda, Crustacea, Pycnogonida, Echinoderms and even some Chordates are also found, sometimes in large numbers. In this work Dr. Gravely has dealt with the commonly occurring forms of all these classes and provided short descriptive accounts, and excellent line drawings of representative species. In the case of hermit crabs and some edible crabs distinguishing characters of the commonly occurring genera and dichotomous keys for their identification are also published.

The main part of the work is devoted to the bivalve shells—mussels, shipworms, etc. (Lamellibranchiata or as they should more correctly be termed Pelecypoda). This part of the account is much more detailed than that dealing with other classes of animals. A simple but very useful dichotomous key of the various families is followed by brief accounts of the families, descriptions of the species and notes on their habitats. Figures usually of the right valve of a representative species of each genus are also published.

The account is based on the collections in the Madras Museum, fresh collections made by the author, and, last but not the least, the very rich collection of Mr. M. D. Crichton of Madras. All species definitely recorded from Madras are included, even though many of them are only found in the harbour or brought up by fishermen in nets and do not seem to get washed on to the sands. An interesting fact that has come to light is that many of the species which are marine at Krusadai Island near Pamban are exclusively estuarine at Madras. According to the author, this is probably due to the confinement of mud to the backwaters at Madras. As is, however, stated, further work is necessary to determine how far estuarine species are able to stand changes in salinity to which backwaters are subject, if they are to survive the changing conditions throughout the year.

In the descriptions and general accounts the author has tried as far as possible to replace scientific terms, which may not generally be intelligible, by more easily understood words, but this has not always been possible. For the same reason the names of the authors of the species and references to literature, synonymy, etc. are given at the end of the paper; this information would enable serious students to pursue the matter more easily. The detailed index of the names of genera and species adds to the value of the work.

Dr. Gravely's attempt to produce a semi-popular but scientifically accurate account of the animal remains of the Madras beach is very welcome, and it is hoped that it will be followed by similar works for other parts of the country and also for other groups of animals. Unless such works become available, the study of Natural History by amateurs is not likely to make much headway.

The work is well printed and the illustrations well reproduced. The price of Rs. 3-2-0 for a work of this type does not seem to be excessive.

• B. P.

¹ The second part on snails is under preparation.

II.—THE ECOLOGY AND CONTROL OF THE FOREST INSECTS OF INDIA AND THE NEIGHBOURING COUNTRIES. By C. F. C. Beeson. Published by the author, printed at the Vasant Press, Dehra Dun, 1941. Pp. i-ii + 1-1007, price Rs. 15.

The work under review is a veritable compendium of practically the whole field of our knowledge of the forest insects of economic importance in India. The fact that the author has been engaged in forest-entomological research in India during the last 30 years should ensure that the book is authoritative. The author also seems to be well posted with up-to-date literature. By a happy thought he has interspersed the text with apt and delightful quotations from that boon companion of our childhood, *Alice in the Wonderland*.

The book begins with an excellent chapter on the history of forest entomology in India. The early struggles to interest governmental heads in forest-entomological research are described, and also how they were finally successful. Nevertheless, they are of live interest to this day when one finds almost the same apathy. The growth of our knowledge of forest entomology in India may be judged from the fact that whereas in 1899 the life-histories of only about 100 forest insects were known, the present book deals with some 4,300 species, and this figure does not include all the species worked out.

Dr. Beeson estimates the total expenditure on the entomological branch of the Dehra Dun Institute during the last thirty years at rupees sixteen lakhs. A single major infestation in forests might cause damage equalling that figure. Entomological research conducted at the Institute has controlled at least one such infestation. Therefore, all the knowledge gained, the library and the insect collections that have been built up, and the numerous infestations controlled to-date can be regarded as a net profit available for financing future research. However, said Alice, 'I can't believe that'!

The rest of the book is divided into two parts. Part I (pp. 19-792), 'The Ecology of Forest Insects', deals with the ecology and life-history of nearly 4,300 insects affecting forests. In accordance with the author's peculiar alphabetical arrangement, the first order dealt with is Anoplura, the second Coleoptera, and so on. Under each order, the families are arranged alphabetically, and under each family the various species also follow a similar arrangement. For each species a list of the plants attacked is given, followed by a brief description of the life-history. The more important species are dealt with in considerable detail. At the end of each family, or in some cases, each species, a list of references is given. Thus, the references to literature are interspersed throughout the book.

Part II (pp. 793-990) deals with control measures. At first the general factors governing the abundance of insects are discussed in considerable detail, including factors both of natural control (e.g., climatic, nutritional and biotic) and artificial control (e.g., silvicultural, biological, mechanical and chemical). This is followed by the section on scientific control measures for the specific pests.

At the end there is a subject index. The illustrations are numerous and good.

The book suffers from certain defects for which both the author, as publisher, and the printers must share responsibility. To start with, there is no table of contents. Such a table would have been invaluable for reference purposes. The scattering of literature in a hundred and one places in the body of the book is an annoying practice and makes consultation difficult. The author might have listed the references at the end of each chapter, or, best of all, at the end of the book. While the illustrations are on the whole good, their utility is in several cases marred by an absence of margin, resulting in essential parts of the illustration being trimmed away. The arrangement of the insect orders and families alphabetically rather than in their natural sequence based on affinity is a grave defect. However, for the species within the family the alphabetical arrangement seems to serve a practical purpose. These are, however, minor defects in an otherwise sound book.

We can heartily commend this excellent book to all forest officers and entomologists. It provides an up-to-date textbook on forest entomology in India, and Dr. Beeson is to be congratulated on producing it at the low price of Rs. 15.

M. L. R.

MISCELLANEOUS NOTES

I.—AN HERMAPHRODITE TIGER.

I send you the few details available of an hermaphrodite tiger shot recently in the Nilgiris.

The tiger was enormously fat but unfortunately it was not weighed, and measured 10 ft.

The male organ was above and the female lower down. Both were very small.

The tiger was never seen with any other tigers, and has been well known for about a year 14 miles to the west of Ootacamund.

If you have any record of an hermaphrodite tiger please let me know.

LOURDESVILLE,

OOTACAMUND,

November 9, 1941.

C. FRASER.

II.—THE INDIAN WILD DOG.

(A correction).

In my article on 'The Indian Wild Dog' (*Journal*, Vol. xli, page 695) I pointed out under the heading *colouration* that Mr. Dunbar Brander states in his book, 'Wild Animals in Central India', that in the C. P. the white tip to the tail is much more common than the black tip.

Mr. Dunbar Brander brings to my notice that his meaning, as expressed in his book at page 28 was not perhaps sufficiently explicit and I have quoted him under a misapprehension of his meaning. The sentence quoted, he points out, should be read together with the previous sentence in the book. He never meant to convey that a white tip to the tail is common, but that it is common for the grey hairs within the black tuft of the tail to amount to a small white tuft within the large black tuft.

I am glad to enter this correction to make it clear that white tips to C. P. wild dogs' tails are not common. The three lines below Dunbar Brander's description as excerpted in my article should be deleted when being read.

BANGALORE,

October 28, 1941.

R. W. BURTON,

Lieut.-Col.,

Indian Army (Retd.).

III.—WIDESPREAD RABIES AMONG WILD DOGS ON THE BILLIGIRIRANGAN HILLS (S. INDIA).

Rabies among wild dogs on the Billigirirangans, and surrounding areas, is so widespread that a considerable number of Sholagas (aborigines) in all parts of the hills have been attacked and bitten; one has already died of hydrophobia. Cattle have been bitten, and domestic dogs. Three coolies on one of the coffee estates were bitten; the wild dog entering into their house. The dog was killed; as also another which made repeated attacks on a cartman. The brains of both these dogs have been reported as positive for rabies by the Pasteur Institute.

Two or three other dogs have been killed by the local Sholagas. The disease is reported to be spreading.

R. C. MORRIS,
Captain.

IV.—A COIN LODGED IN A TIGER'S PALATE.

Captain Chetwode's interesting note under this heading in your *Journal*, Vol. xli, No. 1, appears to have remained unanswered.

I do not think there is any reason to suppose that the tigress was a 'maneater', or that the coin was fired from a gun.

In many parts of India, cattle and especially young calves of both cows and buffaloes, are decorated with necklaces of beads and charms, among which are frequently seen pice and metal talismans.

This rather exceptional case might have arisen by the tigress killing an animal so decorated.

In the heat of excitement a bite on a worn coin, might easily have embedded it into the roof of the mouth. Time healing and causing it to adhere to the roof of the mouth of the tigress.

BELA HARIYA,
BRIDGMANGUNG,
DIST. GORAKHPORE, U.P.
October 11, 1941.

A ST. JOHN MACDONALD.

V.—MEASUREMENTS OF AN INDIAN BISON HEAD (BIBOS GAURUS).

I enclose the measurements of the head of a very old solitary bull bison which died of old age lately in the Travancore Game Sanctuary. He was well known to visitors to the Sanctuary and was the subject of many a photograph.

This head has now been placed in the Government Museum at Trivandrum.

I also enclose for comparison the measurements of the largest head which was in the Museum prior to this.

MISCELLANEOUS NOTES

101

I believe the head now placed in the Museum constitutes a World's record, but would beg you or any of your readers to kindly let me know whether I am correct about this.

	Measurements of the new bison head.	Measurements of the largest head in the Museum.
Tip to tip ...	29.7"	26.9"
Spread (extreme width) ...	43.7"	43.3"
Girth of horn ...	17.8"	17.0"
Length along outer curve of right horn ...	32.5"	30.7"
Length along inner curve of right horn ...	25.7"	25.0"
Weight ...	45.5 lbs.	33.5 lbs.

GAME WARDEN,
TRAVANCORE,

S. C. H. ROBINSON.

November 12, 1941.

[The record Indian Gaur head measures as follows. Tip to tip 39; spread 44 $\frac{3}{4}$; girth of horn 20; length along outer curve 31 $\frac{1}{2}$. The animal was shot in Siam by Lt.-Col. C. H. Stockleg. The largest head from S. India, measures tip to tip 34; spread 43 $\frac{3}{8}$; girth of horn 17 $\frac{1}{2}$; length along outer curve 30 $\frac{3}{4}$.—Eds.]

VI.—NOTE ON THE OCCURRENCE OF THE ENGLISH (?) PARTRIDGE (*PERDIX PERDIX* L.) IN NORTH PERSIA.

On the 24th October 1941 I was proceeding north from SENNA in Persian Kurdistan (approximately 90 miles north of KERMANSHAH.) Twenty miles north of Senna, close to HUSSAINABAD, at about 10 a.m., I saw a covey of birds, obviously partridges of some sort, run into a cover of willows and bushes on the banks of a mountain stream. I walked them up and killed a brace and, on picking them up found them to be, as I thought, unmistakable English partridges. There were about 14 birds in the covey.

The same day, 50 miles further north, at a small village called SENATA where I camped for the night, a covey of partridges settled in the field in which I was camped at about 5 p.m. I shot one of them.

I passed through Hussainabad again on the 26th of October and stopped to walk over the area in which I had first seen the partridges. I put up three coveys, each of 12-16 birds, and killed another brace.

On October 30, in the mountains about 15 miles west of Senna I put up another strong covey and killed one bird.

I killed more of these partridges at Hussainabad on November the 23rd.

On November the 24th when beating out a small plantation of poplars a mile south of Senna for Woodcock, in addition to the

Woodcock a solitary partridge also came out which I killed. An old bird.

I have been shooting partridges at home for close on 30 years and as far as I could see there was no difference between these birds and the English partridge. Silvery legs for old birds, yellow legs for young; some had complete chestnut horse-shoes on their breasts, some partial and some none.

They appear to live at an altitude of round about 6,000 feet. The places where I found them were all between 5,500 and 6,500 ft. The country consisted of mountains. Where the mountains were earth and stones, with patches of cultivation on the hill sides, one found the partridge, where they were rocky one found the chikor. The partridges appeared to be fond of the thickets of bushes of various kinds growing along the stream beds.

Unlike the partridge at home, they are great runners, and if found on open ground will continue running indefinitely rather than take to wing. If there is any further information I can give, I shall be glad to do so, and would be very interested in anything you can tell me about these birds.

BOMBAY,

'PERDRIX'.

5th January 1942.

[The Partridge (*Perdix p. perdix* L.), resident in the British Isles, is generally distributed over the greater part of Europe and is replaced by closely allied forms in the Alpine meadows of the Pyrenees, the Mediterranean, the Altai and Northern Persia.—Eds.]

VII.—THE NESTING OF THE MALABAR GREY HORNBILL.

Never having seen a hornbill's nest, I ran down to Khandalla on 14th April, 1941, with Br. Navarro of St. Xavier's College to examine a reported nest of the Malabar grey hornbill (*Tockus griseus griseus* [Latham]).

Hornbills were heard all morning, but when we reached the nest it was past 11 and most birds had stopped calling. The nest was 40 ft. up in a tree with the entrance facing a hill-side, where we concealed ourselves and waited. The male approached cautiously and silently, settled down on a lower branch and made a decided attempt to regurgitate. A small red berry appeared at the tip of its beak. The bird then visited the hole and shoved in its head and shoulders.

He came back without the berry and then went through the regurgitating and straining process again, producing another berry. It returned to the nest, apparently fed the invisible female and flew silently away. After half an hour, the male appeared again, carrying a dragonfly in its beak. We were, however, seen, and the bird flew off, returning by another route 20 minutes later, but still carrying the apparent lure. It took fright again and returned after 15 minutes, but now without the dragonfly. The bird was shot and about 25 red berries of *Ixora* sp. were found in its gullet, 10

more having spilled out as it fell. There was no trace of the dragonfly, but the stomach contained remains and seeds of 40 more berries. There was no trace of any covering to form packets of seeds, as has been suggested by other observers.

The female was taken off three naked young (two much larger than the third) and an addled egg. She had finished moulting her wings, but the new quills were too short for use. The tail was also moulting, the new rectrices being only 2 inches long, while four of the old feathers remained. There was no body moult. Patches under the tree showed that the female ejects her faeces from the hole.

Br. Navarro who has examined several other nests tells me that the male feeds the female the whole day. It is extremely noisy in the morning and the cackling suddenly stops at about 10. The feeding continues and the bird becomes noisy again at about 5 in the evening. He has also noted all nests in holes facing a hill-side.

He has noted the male tapping at the entrance, patiently waiting the female's consent to be fed. Considerable waits are involved, but the tapping continues.

Several factors appear to have been established, but a more detailed account of this bird's strange nesting habits would be of interest and value.

BOMBAY,

January 17, 1942.

HUMAYUN ABDULALI.

VIII.—THE IDENTIFICATION OF THE SMALL CUCKOO.

A hepatic Small Cuckoo (*Cuculus poliocephalus poliocephalus* Latham) from Khandalla (Navarro, 15th October, 1935) with a 145 mm. wing caused a lot of trouble in identification, and I might draw attention to the difficulties experienced.

The *Fauna* is wrong in requiring a 150 mm. wing for this species, and if it were not for another skin in the St. Xavier's College Collection (Palacios, Khandalla, Oct. 1931), wing 140 mm., named by Whistler, I might still have been guessing at its identity.

Similar birds from Assam in the Society's Collection are wrongly labelled *Cacomantis merulinus*. This species is much larger than *Cacomantis* and *Penthoceryx*, and in hand the hepatic phase may be separated from the latter by the black bands across the breast being much broader and thicker, and the head being, generally darker. The white spots along the shafts of the tail feathers are also distinctive.

A third bird in normal plumage from the same locality also obtained in October (wing 148 mm.) appears to indicate that it is a common passage migrant (?) as in Dhulia (Davidson, Sept. Oct.) though a white egg 19×14 mm. from a tailor bird's (*Orthotomus*) nest (15th June, 1941) is attributed to this species. There is no record of the Small Cuckoo from the immediate neighbourhood of Bombay.

BOMBAY,

January 17, 1942.

HUMAYUN ABDULALI.

IX.—THE COMMON HAWK-CUCKOO OR BRAIN FEVER BIRD.

A common hawk-cuckoo (*Hierococcyx varius*) laid two eggs in a crow's nest in my bungalow compound. The foster parents, who to my mind appear to be rather perturbed with the results, are at present busy feeding the young cuckoos.

There are two points which I think might be of interest.

First. Is it usual for a cuckoo to lay two eggs in one nest?

Second. I always understood that a cuckoo laid its egg or eggs (?) in the nest of a bird smaller than herself.

BISHNAUTH,

D. G. MESTON.

ASSAM.

September 19, 1941.

X.—THE DISTRIBUTION OF THE ROSY TERN.

Messrs. Whistler and Kinnear in their report on the Eastern Ghats Ornithological Survey (*J.B.N.H.S.*, xxxix, p. 249) refer to the fact that there appear to be no specific records of the Rosy Tern (*Sterna dougalli korustes* Hume) in the Madras Presidency, and object to its inclusion in Baker and Inglis's 'Birds of Southern India'.

On a recent visit to Madras, I dropped in at the Government Museum, and was surprised to see a group case, showing a pair hovering over eggs, labelled 'Rameswaram Island—June 1914'. With the kind assistance of Dr. Aiyappan of the Museum, both the identity of the bird and the correctness of the data have been confirmed.

BOMBAY,

HUMAYUN ABDULALI.

October 20, 1941.

[Subsequent to the above note we had the following letter from Mr. Abdulali:

'In continuation of my letter and notes of the 30th ult., I might mention that "Viziadrug" (which locality was apparently untraceable *J.B.N.H.S.*, 39, p. 248 under *Thalasseus bergii velox*) is a small port on the west coast between Ratnagiri and Malwan, and has therefore nothing to do with the Madras Presidency. In that excellent map accompanying the third volume of the Fauna, it appears as "Vijayadrug".—Eds.]

XI.—SOME BIRDS SEEN FROM THE TRAIN IN THE MADRAS PRESIDENCY.

A glance at that valuable and impressive report on the birds collected by the Vernay Scientific Expedition of the Eastern Ghats, will reveal the paucity of information regarding the most common species in the Madras Presidency.

On the 12th October I went down to Madras by train and took the Eastern Ghat papers with me for reference. We had hardly crossed the Tungabhadra River into the Madras Presidency, when almost every bird seen appeared to add to the information available. I was in Madras for only two days, and notes were kept on the return journey also. While none of the notes claim to be revolutionary or startling, they fill apparent gaps in our information and suggest possibilities of bird watching from trains in these days of petrol rationing. I need hardly stress that without an authoritative reference in hand, it is impossible to discriminate between the relative value of observations. These notes—for whatever they are worth—would never have been written if I had not had the survey reports with me.

South of the Tungabhadra, Brown Doves, Green Bee-eaters, King-crows, Bay-backed Shrikes, Blue Jays, Kestrels, Brahminy and Pariah Kites were common almost all along the line.

The other records are detailed together with extracts from the survey report in parenthesis.

Argya caudata at Kupgal near Adoni. ('Few records').

Saxicola caprata subsp. This was common round Adoni. There were *Agave* hedges running on both sides of the railway, and the birds appeared partial to them. Fewer birds were seen further south (where these plants are less prominent), though one was noted at Arkonam. Strangely enough, no *saxicoloides* were seen anywhere.

Lanius excubitor. More than one bird seen near Adoni. This appears to be a fresh record for Madras.

Temenuchus pagodarum at Kupgal near Adoni. ('Southern portion of the Northern Circars').

Passer domesticus. Seen at Adoni and Guntakal Stations. ('No information if it occurs north of Madras'.)

Motacilla alba. One seen near Madras.

Merops supercilii subsp. A few single birds were seen round Madras, but they appeared commoner and more numerous around Tadpatri, 30 miles south of Gooty (Anantapur Dist.) The movements of both sub-species are very imperfectly known and further notes would be of interest. In the Bombay-Salsette paper (J.B.N.H.S., Vol. xl., p. 169) we have referred to both *persicus* and *javanicus* as passage migrants in Sept.-Oct. and treated the latter race as the apparently regular and common form. These birds are commonly met when snipe shooting, and it is strange that two birds subsequently obtained (Dharamtar Creek, 17-xi-40 W—155 and Bhyander 19-x-41 W—150) should both be *persicus*!

Tockus birostris. Four seen flying through a palmyra grove at Kupgal, just south of the Tungabhadra. ('Not recorded north of Palkonda Hills').

Micropus affinis. Dewar says 'it is not very frequently seen in Madras', but I found it the commonest bird there!

Butastur teesa. Not found by the Survey and said to be scarce in the Presidency. At least four birds were seen in the open country between Cudappah and the Tungabhadra.

Streptopelia decaocto. Often noted south of the Tungabhadra

though not procured by the Survey ('appears to be far less common in the Presidency than in other parts of India').

Butorides striatus seen at Madras. ('Occurrence on eastern side of the Presidency has not been substantiated beyond the fact that a local specimen in the Madras Museum is apparently the basis for its inclusion in Dewar's Madras list.')

BOMBAY,
November 30, 1942.

HUMAYUN ABDULALI.

XII.—THE DISTRIBUTION OF THE NUKTA OR COMB DUCK IN SIND.

While shooting on the Bakarwari Dhand, near Sujawal, Karachi District, on the 27th December 1941, two comb duck (*S. melanotos*) were seen together by me.

I shot the female, and the skin is in my possession.

As this is a very rare duck in Sind, I am reporting the matter in case you desire the information for record.

On the previous day the bag from an adjoining dhand included one female cotton teal.

EXECUTIVE ENGINEER,
KARACHI BUILDINGS DIVISION,
VICTORIA ROAD, KARACHI,
January 11, 1942.

N. M. MENESSE,
I.S.E.

[According to Dr. Ticehurst (*Ibis*, vol. v., p. 443, 1923) the Comb Duck only occurs in the Southern and Eastern portions of the Sind Province, nearly all the records being from the Sujawal District.—Eds.].

XIII.—OCCURRENCE OF THE CHINESE HAWK-EAGLE (*SPIZAËTUS N. FOKIENSIS* KIRKE-SWANN) IN THE CHIN HILLS.

I enclose the skin of a hawk or eagle shot at Falam in the Chin Hills Burma altitude 5,300'. Would you please identify the bird and let me know the result.

BURMA FRONTIER FORCE,
FALAM,
CHIN HILLS,
BURMA,
June 1, 1941.

A. C. MOORE,
Major.

[The bird forwarded to us by Major Moore is an example of the Chinese Hawk-Eagle (*Spizaëtus nipalensis fokiensis* Kirke-Swann). The distribution is stated to be S. China south to the Indo-Burmese countries and Tenasserim.—Eds.]

XIV.—THE CROCODILE IN BURMA.

I should be interested to know whether any of your readers can throw some light on the distribution of crocodiles in this country.

As far as I can ascertain, the only common Crocodile here is *Crocodilus porosus*, which is confined to the mud banks and mangrove swamps of the coast of Tennasserim and certain parts of the Delta.

Although Peacock in his 'Game Book of Burma' states that both *Gavialis gangeticus* and *Crocodilus palustris* (or possibly *C. siamensis*) rarely occur in the Irrawaddy I have never met anyone who has confirmed this observation. Even if rare specimens do sometimes occur it seems to me a remarkable fact that these two species have been unable to establish themselves in any numbers in the Irrawaddy when they are so common in the Indus, Ganges and Brahmaputra. Although crocodiles are now unknown near the town of Pegu, Ralph Fitch who visited it in 1590 tells us that the moat was full of these reptiles. Sangermano who visited Burma two centuries later states that 'Crocodiles are not very numerous in the great river Ava (Irrawaddy)' which would rather point to the fact that crocodiles did once inhabit our rivers but are now almost extinct there. This view is rather endorsed by the name Migyaung-ye literally (Crocodile Water) which is a town situated on the river some 250 miles up from the mouth of the Irrawaddy.

Although I have frequently asked Burmans living on the banks whether they have ever seen crocodiles in this area, they all replied in the negative though some of them added that they often met their young on shore. By their young however they explained that they meant the 'Hput' (*Varanus monitor*) which is common in the Dry Zone and which many Burmans believe transforms itself later in life into a crocodile.

BHAMO BATTN.

J. A. M. SYMNS.

BURMA FRONTIER FORCE,

September 10, 1942.

[Of the various species of crocodiles occurring within our region *C. porosus* is known to occur in Burma. As regards *C. palustris*, its existence in Burma is at present doubtful. Theobald (1868) recorded a large specimen from Thayetmyo and remarked that it was the only specimen he had ever seen in Burma. There is no record of its having been obtained since. As regards *Gavialis gangeticus*, it is said, in the new edition of the *Fauna*, to occur in the Kaladan river, Arrakan. Barton '1929' records a specimen shot at the mouth of the Maingtha, a tributary of the Sweli River, Upper Burma. It is the sole record from the Irrawaddy river system.—Eds.]

XV.—NOTE ON AN EXPERIENCE WITH AN INDIAN PYTHON (*PYTHON MOLURUS*).

Some twenty-eight years ago in the low country of the Province of Uva, in Ceylon, one cloudy afternoon I wounded a spotted deer. A Sinhalese village tracker and I followed the blood spoor, the Sinhalese leading. The spoor went down into a small gully containing running water and up the other bank along a game track.

The tracker was running about six or seven yards ahead of me, up the bank, when I saw about six feet of a python dart suddenly at the calf of the man's leg and as suddenly withdraw. I could have sworn that the snake's head had made contact with the man's leg. I naturally stopped dead at seeing what had happened and called to the man. He stopped and turned and I told him what had happened. He said he had not been touched. We then looked into the dense undergrowth by the game path and, within two feet of the path, there was a 'pile' of python neatly arranged. The Sinhalese jungle villager remarked 'they never catch a man'. I killed the snake, which measured some fourteen feet, and it was difficult to get the python off its anchorage. Since then, I have asked many Ceylon jungle folk whether a python will catch a man and have been invariably informed 'no'.

KANDY,
CEYLON,

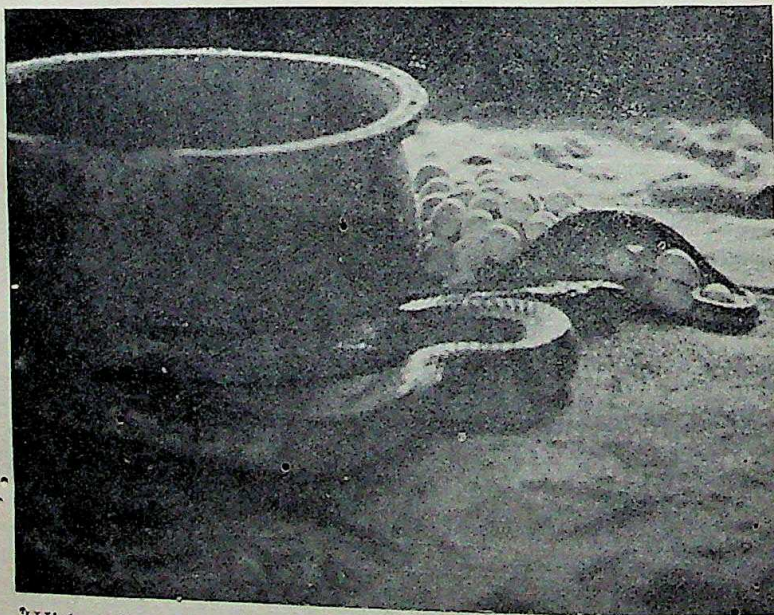
September 21, 1941.

F. J. S. TURNER.
Ceylon Forest Dept. (Retd.)

[While the Indian Python may attack a man, there appear to be no authentic records of this snake actually overcoming or swallowing a man though capable of doing so.—Eds.]

XVI.—THE NUMBER OF EGGS IN THE CLUTCH OF
THE CHECKERED WATER-SNAKE (*NERODIA PISCATOR*).

(With a photo).



With reference to the note on the record number of eggs (88) laid by the Chequered Water Snake, *Nerodia piscator*, published on p. 225, Vol. xxxii of this *Journal*, I wish to report that this record has been slightly raised by a specimen kept in the

Trivandrum Zoo, laying 91 eggs on 29-1-42. The eggs were of the usual type described for this species. The snake took one minute to void the egg that I watched, while the interval between two successive voidings was 10 minutes. One egg taken at random measured $9/10$ in. \times $8/10$ in.

Major Wall, on p. 864, Vol. xvii, of this *Journal*, instances two cases of this snake extruding eggs into water. In the present case however, it may be seen from the picture that the snake has chosen to lay beside the *gumlah* of water, though it was seen to rest coiled up in it for hours together the previous day.

GOVT. MUSEUM,
TRIVANDRUM,

N. G. PILLAI.

February 18, 1942.

XVII.—GLOW-WORM (*LAMPHROPHORUS NIPALENSIS* H.) FEEDING ON A SLUG.

In your letter dated 9/9/38 you mentioned that the larvae of the glow-worm *Lamphrophorus nipalensis* H. (*Malacodermidae*, *Lamphrynae*) were carnivorous and feed largely on land snails. It may be of interest to let you know that I saw one of these larvae feeding here last week. It was on an almost bare twig of a bush in the garden and was hanging head downwards clasping the twig with its extreme posterior pair of legs. Firmly held by the front legs was a slug about $\frac{3}{4}$ of an inch long and the larva was chewing its way into the slug from the head. Its mandibles could be clearly seen moving. There was also a good deal of froth round the insect's mouth. The slug was apparently dead but looked quite fresh. The time was 11-30 a.m. and the weather was sunny, but there had been heavy rain the night before.

DEBRUGARH,
LAKHIMPUR DISTRICT,
ASSAM.

R. E. PARSONS, F.R.E.S.,
Indian Police.

September 10, 1941.

XVIII.—THE PLANT-BUG *CYCLOPETA SICCIFOLIA* WESTW. ON *PONGAMIA GLABRA*.

On the 29th December 1941 at Khandala, W. Ghats, I observed large numbers of plant-bugs (*Cyclopelta siccifolia* Westw.) clustered together on the thinner branches of the *Curanj* trees (*Pongamia glabra*). These clusters, composed of about 50-100 bugs, were small when compared with the masses of bugs collected in the hollows of the trunks and main branches. These masses were often nearly a foot in diameter and from 3-6 bugs deep, all piled one on top of the other! The bugs were extremely sluggish and it was with more than gentle persuasion that they were induced to move. Even when knocked down it took them some time to 'wake up'. Judging from their behaviour it seems that the bugs had collected in this fashion to pass through the cold months. I brought a large number to Bombay in a cigarette tin, but the difference in temperature between the cold of Khandala and the warmer temperature of Bombay did not

increase their activity—they just huddled together in the tin. It may be of interest to note that these bugs only infested the *Pongamia* trees.

I noticed similar conditions while in Rajputana with a species of *Halys*. In this instance the bugs clustered in the hollows of Peepal trunks (*Ficus religiosa* L.). When the weather became warmer I found egg-clusters in the same hollows. This seems to suggest that the winter clusters bring together the sexes prior to the breeding season which follows hibernation (?). However, this is a point I must leave to future observation.

BOMBAY NATURAL HISTORY SOCIETY,
BOMBAY,

*C. McCANN.

January 5, 1942.

XIX.—A BATTLE BETWEEN BLACK AND RED ANTS.

On June 28, 1941, I happened to witness a battle between a party of red ants (*Oecophylla smaragdina*) and a column of black ants (*Camponotus* sp.) in which several of the latter were taken prisoner, and subjected to the stretching process described in Major R. W. G. Hingston's illuminating study of the Red Ant on p. 681, Vol. xxix of this *Journal*.

I was coming up the path leading to the Museum when I noticed a column of black ants in front of me, crossing the path and making for the lawn on the right side. As there was nothing unusual, I was about to move on, when a number of curious patterns fixed to the floor and sides of the drain, near the point where the ants crossed it caught my attention. Each had a black line in the centre, surrounded by a number of brown strands radiating from it, reminding one of the structural formulae in books of Organic Chemistry. On nearer approach, I found that the black ants were being attacked by a party of red ants as they crossed the drain, and that the black ants, captured during the fight, were put 'on the stretch' by the conquerors which hooked themselves by their jaws to the limbs of the prisoners, somewhat in the manner of the spokes of a wheel.

These red ants were part of a large colony which lived on a neighbouring tree. Disposing themselves on the floor and left slope of the drain, so that they had the left flank of the black ants exposed to their attack, they crept up to the enemy line and waited with waving feelers for a suitable 'jawhold' on the passing ants. In a moment one of them would dart forward, seize a black ant by the leg and pull the victim towards it. The captive struggled, but nothing was of avail against the steady pull of the red ant, which by now, with its legs firmly planted on the ground and with abdomen slightly tilted, set about its task in a determined manner. A passing red ant soon turned up and offered to help by taking hold of one of the legs and pulling it in the opposite direction. One by one, more ants collected on the spot and following the example of the others, took hold of the remaining limbs and helped to keep the prisoner down until the curious patterns referred to above were formed.

The chief strategy of the black ants in this conflict was flight under cover of a rear guard action fought by a few which separated from the column and faced the enemy. There they stood eyeing

MISCELLANEOUS NOTES

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each other, ready to attack. But suddenly a red ant would dash forward and seize his opponent by the leg. Invariably the red ants were the victors in these frontal attacks. None of them was captured as the black ants seemed to be mainly on the defensive and attempted only to engage the enemy while the majority escaped. But occasionally a red ant slipped from the rather steep slope of the drain into the middle of the enemy's ranks, when they closed in on it like Furies and meted out swift punishment.

The battle lasted for about 3 minutes until the last of the black ants disappeared over the ledge of the drain.

GOVERNMENT MUSEUM.

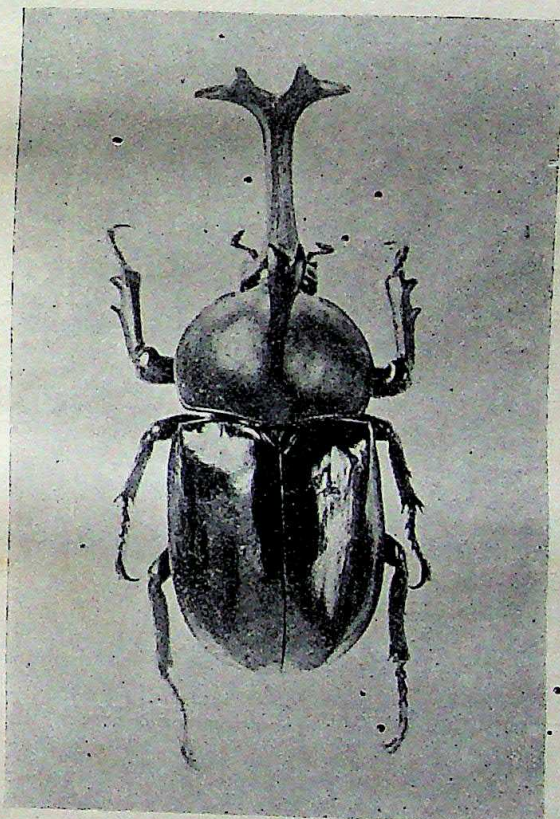
TRIVANDRUM

October 10, 1941.

N. G. PILLAI.

XX.—WANTED MALE SPECIMENS OF THE BEETLE
(*ALLOMYRINA DICHOTOMUS*) FROM INDIA.

(With a photo).



Allomyrina dichotomus. (Nat. size.)

Would you please refer to my note on the beetle, *Allomyrina dichotomus* published on page 668 of Volume XLII of the *Journal*? I have since received another letter from Mr. Gilbert Arrow on this subject. He has sent me a photograph of the male of this

species, specimens of which sex he is very anxious to examine. This photograph I enclose herewith since you may like to publish it with a view to assisting him to obtain specimens. He mentions that the photograph is natural size and represents a specimen from China. Apparently, Indian males are likely to differ slightly from the Chinese males and specimens are required to investigate this matter.

SHILLONG,
ASSAM,

R. E. PARSONS, F.R.E.S.

February 2, 1942.

XXI.—THE DISTRIBUTION OF THE SCORPION (*HORMURUS NIGRIPES* POCKOCK).

In October 1941 M. W. A. Hewitt, District Traffic Superintendent, B.N.W. Rly., Gonda U.P., sent two scorpions which were identified as *Hormurus nigripes* Pocock.

As recorded to date, the distribution of the species is:—Panch Mahals in Gujarat (*Wallinger*); Satna in Central Provinces (*Dane*); Almora in United Provinces (*Hewitt*).

BOMBAY,
November 12, 1941.

J. F. CAIUS.

XXII.—ADDITIONS TO THE FLORA OF WAZIRISTAN.

Papaveraceae.

Papaver polychaetum. Wana, S. Waziristan. Open stony plain L 642 21-4-39.

Glaucium squamigerum Kar. et Kir. Inzar Narai, Near Wana, ca. 5,000'. L. 652. 29-4-39. Also at Tanai and Toi Khula, S. W.

Geraniaceae.

Geranium Wallichianum. Alexandra Ridge, Razmak, ca. 7000' L 9. 1932.

Papilionaceae.

Astragalus ancistrocarpus. Wana, 8-4-39, L 640. In seed, 14-5-40, L 678.

Astragalus purpurascens, Bunge. Inzar Narai, nr. Wana, ca. 5,000'. 29-4-39. L 654.

Onobrychis dealbata, Stocks. Inzar Narai, nr. Wana, ca 5,000' 29-4-39 L 631.

Calophaca ternata, Popow. Inzar Narai, nr. Wana, ca 5,000', 29-4-39. L 649.

Primulaceae.

Primula floribunda. Ladha, SW. 1921.

Compositae

Scorzonera papposa DC. Wana, 24-4-39; No. 645.

Senecio Desfontainei Druce. Wana, 24-4-39; No. 646.

Achillea santolina. Wana, S. Waziristan. In flower 13-5-40. On banks between fields. No. 676.

MISCELLANEOUS NOTES

Nonnea picta: Wana, S. Waziristan. In flower 28-3-40. Fields and cultivated land. No. 670.

LANDI KOTAL,

September 2, 1941.

D. G. LOWNDES.

Major.

XXIII.—FASCIATED INFLORESCENCE OF *ACROCARPUS*
FRAXINIFOLIUS WIGHT.
(With a photo).

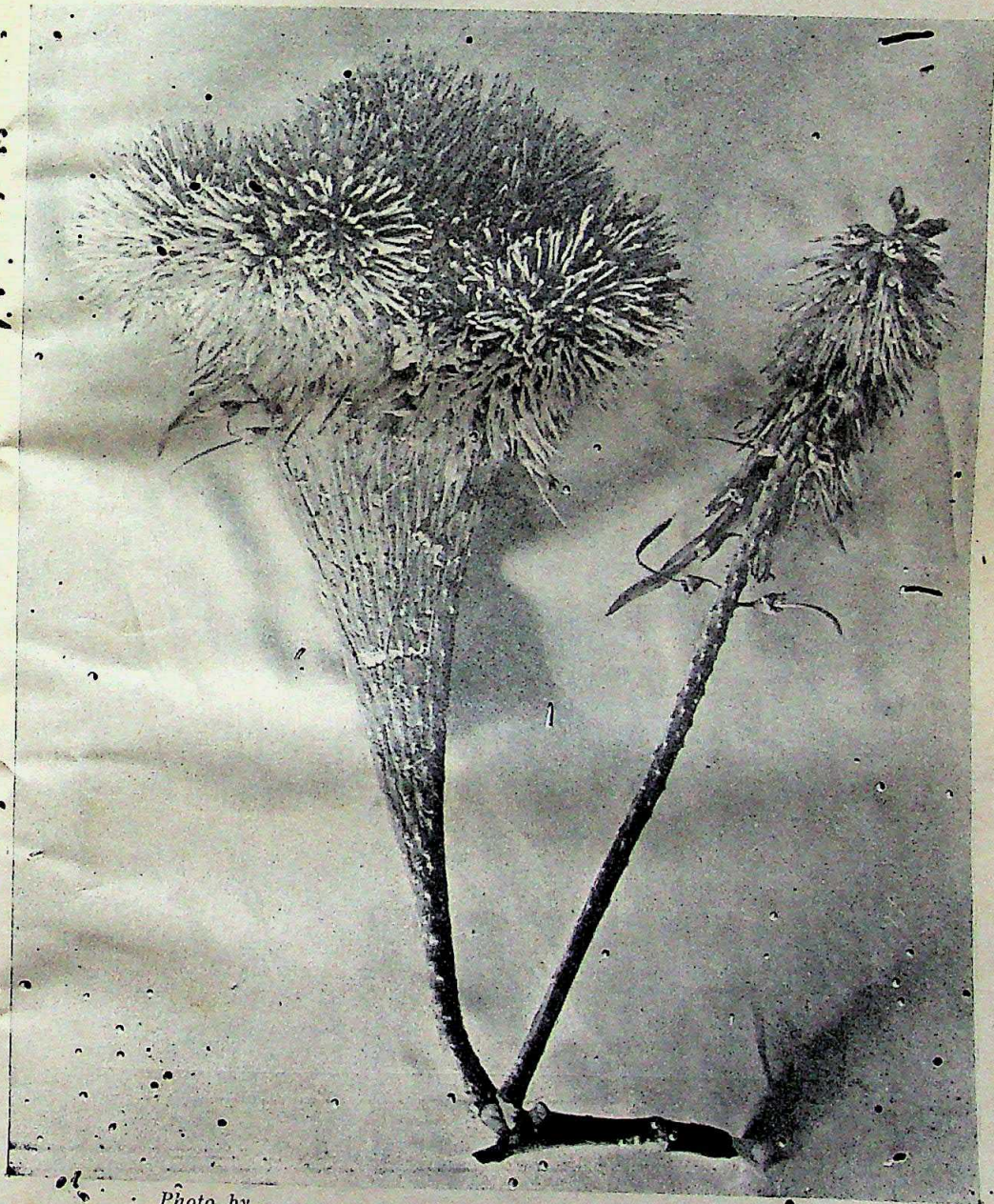


Photo by

Fasciated inflorescence of *Acrocarpus fraxinifolius* Wight.

M. Balnishi.

An interesting case of fasciation of an inflorescence was discovered in the grounds of the Forest Research Institute last March. The species in question was *Acrocarpus fraxinifolius* Wight, a species widely distributed in the evergreen forests of India and Burma, and which ordinarily has an inflorescence consisting of short pendulous axillary racemes.

In the accompanying photograph one portion of the inflorescence consists of one very stout raceme, which approximates to the ordinary raceme, but which nevertheless, betrays signs of fasciation. The other portion, however, exhibits extreme fasciations in that the nodes of the shoot have become suppressed and the racemes all arise at one point, finally becoming fused together in a flattened fan-like structure. This portion was 9 inches long and 8 inches broad.

FOREST BOTANIST,
FOREST RESEARCH INSTITUTE,
DEHRA DUN.

N. L. BOR.

November 17, 1941.



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